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A Peer Reviewed Journal for SOF Medical Professionals

This edition's feature articles:

- Field Evaluation and Management of Non-Battle Related Knee and Ankle Injuries by the ATP in the Austere Environment – Part Two
- Canine Tactical Field Care Part Two – Massive Hemorrhage Control and Physiologic Stabilization of the Volume Depleted, Shock-Affected, or Heatstroke-Affected Canine
- A Case of Reactive Arthritis in a Ranger Indoctrination Program (RIP) Student
- Functional Training Program Bridges Rehabilitation and Return to Duty
- The Impedance Threshold Device (ITD-7) A New Device for Combat Casualty Care to Augment Circulation and Blood Pressure in Hypotensive Spontaneously Breathing War Fighters

Dedicated to the Indomitable Spirit & Sacrifices of the SOF Medic

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Journal of Special Operations Medicine

COVER

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A Special Forces medic cleans and bandages an Iraqi man's thumb during a cordon and knock mission in the village of Al-Ma'ejeel, Iraq. The medic also dispensed antibiotics to the man, who burned his thumb. *(Photo by Sgt. 1st Class Chuck Joseph, 196th Mobile Public Affairs Detachment)*

From the Editor

The Journal of Special Operations Medicine (JSOM) is an authorized official military quarterly publication of the United States Special Operations Command (USSOCOM), MacDill Air Force Base, Florida. The JSOM is not a publication of the Special Operations Medical Association (SOMA). Our mission is to promote the professional development of Special Operations medical personnel by providing a forum for the examination of the latest advancements in medicine and the history of unconventional warfare medicine.

 Articles, photos, artwork, and letters are invited, as are comments and criticism, and should be addressed to Editor, JSOM, USSOCOM, SOC-SG, 7701 Tampa Point Blvd, MacDill AFB, FL 33621-5323. Telephone: DSN 299-5442, commercial: (813) 826-5442, fax: -2568; e-mail JSOM@socom.mil. The JSOM is serial indexed (ISSN) with the Library of Congress and all scientific articles are peer-reviewed prior to publication. The Journal of Special Operations Medicine reserves the right to edit all material. No payments can be made for manuscripts submitted for publication.

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JSOM CME consists of an educational article which serves to maintain, develop, or increase the knowledge, skills, and professional performance and relationships that a physician uses to provide services for patients, the public, or the profession. The content of CME is that body of knowledge and skills generally recognized and accepted by the profession as within the basic medical sciences, the discipline of clinical medicine, and the provision of healthcare to the public. A formally planned Category 1 educational activity is one that meets all accreditation standards, covers a specific subject area that is scientifically valid, and is appropriate in depth and scope for the intended physician audience. More specifically, the activity must:

- Be based on a perceived or demonstrated educational need which is documented
- Be intended to meet the continuing education needs of an individual physician or specific group of physicians
- Have stated educational objectives for the activity
- Have content which is appropriate for the specified objectives
- Use teaching/learning methodologies and techniques which are suitable for the objectives and format of the activity
- Use evaluation mechanisms defined to assess the quality of the activity and its relevance to the stated needs and objectives

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Lt Col Michelle DuGuay Landers

Contents

Spring 09 *Volume 9, Edition 2*

Dedication

Staff Sergeant Marc J. Small

SSG Marc J. Small, 29, died of wounds sustained from enemy fire during a combat reconnaissance patrol on 12 February 2009. He was a Special Forces Operational Detachment-Alpha team medical sergeant assigned to Company B, 1st Battalion, 3rd Special Forces Group (Airborne). He deployed in support of Operation Enduring Freedom in January 2009 as a member of the Combined Joint Special Operations Task Force – Afghanistan. This was his first deployment in support of the Global War on Terror.

Small, a native of Collegeville, PA, volunteered for military service and entered the Army in December 2004 as a Special Forces trainee. After Basic and Advanced Individual Training at Fort Benning, GA, he was assigned to the John F. Kennedy Special Warfare Center and School at Fort Bragg, NC, in May 2005 for Special Forces training. His medical training was with John F. Kennedy Special Warfare Center and School at Joint Special Operation Medical Training Center. He earned the coveted "Green Beret" in 2007 and was assigned to 1st Bn, 3rd SFG(A) at Fort Bragg, NC, as a Special Forces Medical Sergeant.

Small's military training and education includes the Survival, Evasion, Resistance and Escape Course, Sniper Course, Basic Airborne Course, Basic Noncommissioned Officer Course, Warrior Leaders Course, and Special Forces Qualification Course. His awards and decorations include the Purple Heart Medal, Army Commendation Medal, Army Achievement Medal, Good Conduct Medal, National Defense Service Medal, Afghanistan Campaign Medal, Global War on Terrorism Service Medal, Noncommissioned Officer Professional Development Ribbon, Army Service Ribbon, Overseas Service Medal, NATO Medal, Parachutist Badge, Combat Infantry Badge, and the Special Forces Tab.

Small is survived by his mother and stepfather of Collegeville, PA; his father and stepmother of Mechanicsburg, PA; and three brothers and three sisters.

Field Evaluation and Management of Non-Battle Related Knee and Ankle Injuries by the Advanced Tactical Practitioner (ATP) in the Austere Environment — Part Two

JF Rick Hammesfahr, MD

Editor's Note: The following article is being published in three parts due to its size and amount of pictures.
Part One – In Vol. 9 Ed. 1 (Winter 2009) consisted of evaluation of knee injuries;
Part Two – Continues on from Part One and consists of taping procedures for the various knee injuries;
Part Three – Will be in the 2009 Summer Edition and will consist of ankle injury evaluation and taping.

Please keep in mind that this entire article applies only to the austere situation. No one would be able to carry all the braces and sleeves for the various joints in different sizes and for right or left that are available in CONUS on the missions.

Knee Ligament Taping

Knee taping is a good tool for the ATP to have in his rucksack treatment categories. By using standard adhesive tape applied directly to the skin, or by using duct tape, it is possible to tape the knee so that the knee and the damaged ligaments are supported. In addition, the taping will also restrict the motion of the knee joint.

Prior to taping, the type and area of damage must be identified as to whether it is a patellar dislocation, torn cartilage, torn medial collateral ligament, torn lateral collateral ligament, or torn anterior cruciate ligament. Once the area of the injury is identified, the skin is cleaned to remove any underlying dirt or debris. With the skin dry, the tape may be applied directly to the skin.

The initial step is to elevate the heel about two inches. This could be on a roll of tape as shown in Figure 22 or on any other object. By elevating the heel, the knee is flexed, giving the optimal position for taping (Figure 23).

Figure 22: *Elevate heel about 2 inches.*

Figure 23: *Heel elevation forces knee flexion for optimal taping position.*

Figure 24: *Proximal anchoring strips of tape applied. Approximately 50% of the thigh is taped with anchoring strips.*

Initially, three or four anchoring strips are applied at the distal thigh and three or four anchoring strips are applied in a circumferential fashion at the proximal foreleg (Figure 24). These anchoring strips are NOT applied in a spiral fashion, but as independent, overlapping circumferential strips. If possible, the leg should be shaved. As an alternative, tape prewrap may be used to protect the skin. In an austere situation, if supplies are limited and prewrap is not available, the tape should be applied directly to the skin. The tape is applied with approximately a 30 – 50% overlap (Figure 25).

Figure 25: *Distal anchoring strips of tape applied covering approximately 50% of the lower leg.*

Figure 26: *Initial crossing stability tape strip.*

Once the anchoring strips have been applied, an X pattern of overlapping tape is applied on each side of the joint (Figure 26 and Figure 27). The crossing of the tape occurs at the mid-portion of the side of the joint, which is where the ligaments lie.

Figure 27: *First set of crossing stability tape strips are applied.*

This is then reinforced with a second set of crossing tape strips (Figures 28 and 29).

Figure 28: *Application of 2nd set of crossing tape strips.*

Figure 29: *Final crossing strip applied.*

Once a double layer of crossing tape strips has been applied, a final single vertical strip is applied (Figure 30).

Figure 30: *Vertical reinforcing strip which further anchors the central X of tape.*

Once the strips are applied on one side of the joint, similar taping is done on the opposite side of the joint (Figure 31).

Figure 31: *Same crossing tape applied to opposite of the knee, centered at the mid-joint line.*

Figure 32: *Proximal circumferential anchoring strips applied proximal to the joint.*

Once both sides have the X-crossed tapes applied along with the vertical reinforcing strip, more circumferential anchoring strips are applied to anchor the medial and lateral X-crossed strips (Figures 32 and 33).

Figure 33: *Distal circumferential anchoring strips applied.*

During the process of taping, it is important to recognize that the popliteal fossa (posterior aspect of the joint) must be left open to prevent the development of tape blisters (Figure 34).

Figure 34: *Popliteal fossa left open to allow for flexion and extension, minimizing the probability of development of skin blisters beneath the tape as the knee moves.*

In addition, the kneecap must be left open to allow normal superior and inferior glide motion (Figure 33). This taping technique will provide rotational stability as well as stability against varus and valgus forces. In addition, flexion and extension will also be somewhat limited.

MENSICUS

When checking for a torn meniscus, it is necessary to palpate the medial and lateral joint lines for tenderness. A McMurray's test is then performed. The medial McMurray's test (Figure 35) is performed by forcibly flexing the knee and palpating the posteromedial joint line (to check the medial meniscus) with one hand. With the other hand, grasp the foot and externally rotate the leg at the hip and apply a varus force at the knee (compressing the medial side of the femur and tibia against the medial meniscus) and extend the knee. If there is a torn meniscus, a click may be felt or heard, and the test is usually painful if there is a damaged medial meniscus.

Figure 35: *Apply a varus force to compress the medial tibia and femur, compressing the medial meniscus.*

Figure 36: *Apply a valgus force to compress the lateral tibia and femur, compressing the lateral meniscus.*

In a similar fashion, the lateral McMurray's test (Figure 36) compresses the lateral side of the femur and tibia together and will pinch the lateral meniscus. The lateral McMurray's test is performed by placing one hand on the posterolateral joint line, grasping the foot with the other hand, forcibly flexing the knee, internally rotating the hip thus producing a valgus force at the knee joint (which compresses the lateral meniscus between the femur and the tibia) and extending the knee. If the meniscus is damaged, this will cause pain; but if the meniscus is normal, this will not cause pain.

When a person has a torn meniscus, this means that the C-shaped piece of fibro-cartilage known as the meniscal cartilage is torn and that this piece of tissue may displace inside the joint. Often it is a semi-attached free fragment much like the balloon on a string. As this fragment moves around, the fragment may go from being in an intra-articular position (Figure 37), but not trapped between the bones (which is a relatively painless situation), to moving to where the meniscal fragment becomes trapped between the bones (Figure 38). When the torn meniscal fragment becomes trapped between the bones, there will be the loss of extension, and increased pain. In addition, the knee may develop an effusion.

Figure 37: *Fragment of the medial meniscus trapped in the medial gutter of the knee, adjacent to the medial femoral condyle. Black circle surrounds the meniscal fragment.*

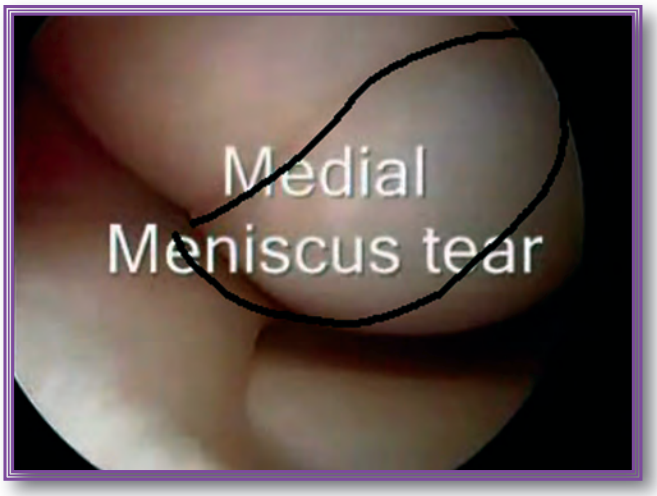

Figure 38: *Medial meniscal fragment trapped in an intra-articular position, between the femur and the tibia. Black circle surrounds meniscal fragment.*

Figure 39: *Joint positioned with the medial side of the joint (where the suspected meniscal tear is located) facing the floor.*

Although difficult, if any injured Soldier presents with a complaint of a locked knee due to a torn meniscal cartilage, he will have pain with terminal extension, loss of terminal extension and difficulty weight bearing. When on a mission in an austere situation, this interferes with the patient's ability to ambulate successfully. Therefore, the only realistic option to continue the mission is to try to reduce the meniscus tear. To successfully unlock a knee and reduce a meniscal tear, it is necessary to define whether the medial meniscus is torn or the lateral meniscus. This is done by palpating the joint lines, performing the McMurray test as described above, and isolating the PRIMARY pain source to the medial or lateral joint line.

To reduce the meniscus, it is necessary to understand the principles that are involved. The reduction of a torn medial meniscus will be described in detail. With a torn medial meniscus, the meniscal fragment has slipped inside the joint into a position between the femur and the tibia, much as a wedge slips between the door and the floor. This wedge or meniscal cartilage prevents the knee from coming into terminal extension. By placing the knee in a position that opens the medial side of the joint, and then by allowing gravity to pull the fragment out of the way (Figure 39 and 40), it is often possible to unlock a knee. This is not a long term curative measure and the knee may become locked again. If this happens, the procedure may need to be repeated. Definitive treatment of a meniscal tear requires arthroscopic surgery.

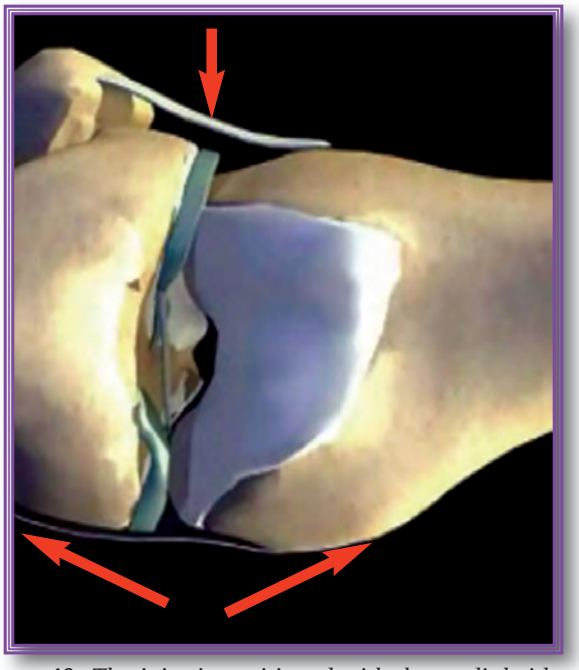

Figure 40: *The joint is positioned with the medial side of the joint (where the suspected meniscal tear is located) facing the floor. With a force directed at the lateral joint line (producing a valgus force), the medial side of the joint opens, increasing the likelihood that the entrapped medial meniscal fragment will drop out of the joint with the effects of gravity and manipulation.*

The procedure itself is rarely successful on the first try and often it is necessary to do this two or three times before the knee will become unlocked. Basically, the knee is placed such that the joint line is perpendicular to the ground (Figures 39 and 41) with the medial aspect of the joint is facing the ground. A downward pressure is applied to the

lateral aspect of the joint (Figures 40 and 42). As this is done, the knee is taken from a position of maximum flexion to extension. Usually by doing this two or three times, it is possible to force the fragment out of the joint and unlock the knee.

Figure 41: *Medial side of joint facing the ground with a downward (valgus producing force) applied to the lateral joint line.*

Figure 42: *Continue force application and gradually straighten the leg.*

In a similar fashion, the lateral meniscal tear may also be reduced by opening the lateral side of the knee, applying pressure to the medial side of the knee and extending the knee (Figures 43 and 44).

Figure 43: *Lateral side of joint facing the ground with a downward (varus producing force) applied to the medial joint line.*

Figure 44: *Continue force application and gradually straighten the leg.*

Once reduced and the motion is returned, it is then necessary to tape the knee to restrict full flexion and twisting. These are the two motions that will often allow the fragment to slip into the joint again.

The ligament taping that has been described previously (Figures 22 through 34) will prevent twisting and restrict full flexion, activities that increase the likelihood of additional locking episodes. The patient is then placed on an anti-inflammatory medication, his rucksack load should be redistributed, and walking sticks provided. Upon return to base, further medical evaluation is required. With respect to evacuation, the

healthcare provider should discuss the mission requirements with the teamleader. If the Soldier can be made functional and is able to continue walking and weight bearing, then the probability of mission completion is certainly greater. However, if the ATP is unable to unlock the knee, then it is unlikely that the patient will be able to remain functional.

Keep in mind that a previously locked knee, which has been successfully unlocked, may again become locked if significant physical demands continue to be placed upon the knee. There may be no advance warning of subsequent locking episodes, consider this when allowing an Operator to return or continue the mission.

Patella Dislocation

Patellar dislocations typically occur with a twisting injury or a blow to the medial aspect of the patella. Occasionally, a blow to the lateral aspect of a partially bent knee, while a patient is pivoting, will allow the kneecap to dislocate. On exam, the knee is typically flexed and there is an obvious deformity of the front of the joint (Figure 45).

Figure 45: *Right knee patellar dislocation with obvious patellar deformity. The patella is dislocated laterally and tilted, distorting the normal anatomy.*

To correlate this to what you would see on an X-ray, the kneecap, which normally sits in the center of the groove, sits on the lateral aspect of the knee (Figure 46).

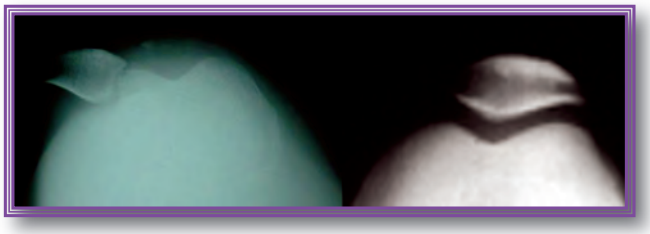

Figure 46: *X-ray appearance of the dislocated patella on the left and the normal appearing alignment on the right.*

When the kneecap comes out of place, this is usually easily reduced by simply bringing the knee into a position of full extension. A mistake that most people make is that they try to reduce the kneecap while the knee is flexed. Not only is this an incredibly painful procedure, but reducing the patella while the knee is flexed causes additional damage to the articular surface of the patella and distal femur (chondral or osteochondral fractures). However, if the knee is brought into a position of full extension, this relaxes the tissue around the kneecap and the kneecap will often auto-reduce. An additional trick is to passively extend the knee into full extension, and then passively flex the hip to approximately 45 degrees. In this position, the quadriceps muscle is relaxed, making reduction of the patella easier. If the patella still is not reducible, then with the knee fully extended (passively), a slight medially directed pressure at the lateral border of the patella will often allow the kneecap to reduce. Once reduced, the knee should be taped and anti-inflammatory medications given. With the knee taped, it is obviously necessary to avoid carrying heavy loads. Once the patient returns to base, further medical evaluation is required. Most Soldiers who have dislocated kneecaps will be able to continue the mission, but again this will need to be discussed with the teamleader.

When taping the kneecap, start with the application of three or four anchoring strips above the knee and three or four anchoring strips below the knee (Figure 47), as previously described.

Figure 47: *With the heel elevated and the knee flexed, the anchoring strops are applied as with the previously described ligament taping.*

The criss-cross tape strips are then applied initially at the lateral aspect of the knee. However, when applying these strips, they should be applied in a criss-cross fashion with the X-centered at the lateral border of the patella (Figures 48 and 49), rather than at the mid-portion of the joint line as done for ligament injuries (Figures 26 and 27).

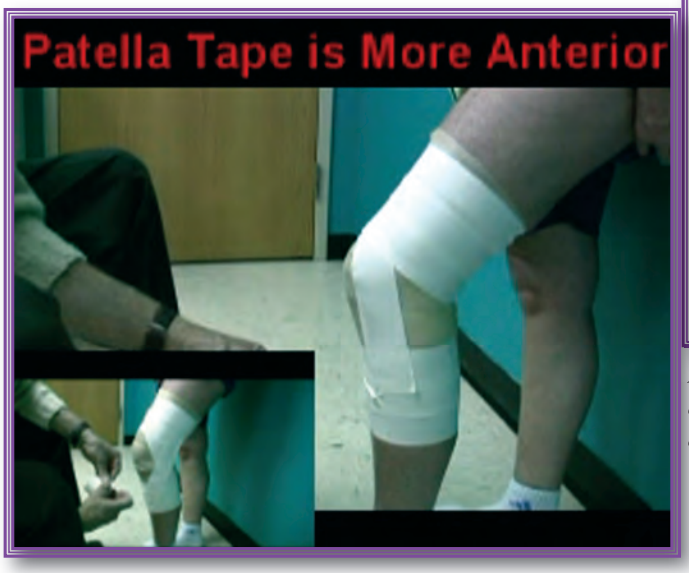

Figure 48: *Crossing tape stripe is initially applied at the lateral border of the patella, rather then at the mid joint line as shown in the insert and Figures 26 and 27.*

Figure 49: *Second X-tape strip applied centered at the lateral patella border.*

After applying two criss-cross strips at the lateral border of the patella, a patella stabilizing strip is applied (Figure 50).

Figure 50: *Patella stabilizing tape strip initially applied at the lateral aspect of the knee, starting posterolaterally and advancing to the lateral border of the patella.*

Once the strip has been applied laterally, the remaining tail is split, forming a Y-shaped piece of tape (Figure 51).

Figure 51: *Split the tape in half lengthwise, forming a Y-shaped piece of tape with two tails.*

After starting laterally with the base, and then passing half the tape at the superior border of the patella and continuing on to the medial aspect of the knee, the second tail is applied to the inferior border of the patella and then onto the medial knee (Figure 52).

Figure 52: *The second half of the split tape is applied just below the inferior border of the patella and then pulled to the medial aspect of the knee.*

Figure 53: *The first additional lateral patellar anchoring strip.*

Figure 54: *The second and final lateral patellar anchoring strip.*

After application of the horizontal Y-shaped patella stabilizing strip, additional reinforcing X-tape strips are applied to the lateral border of the patella (Figures 53 and 54)

Next, the medial tape tails of the Y-shaped horizontal patellar stabilizing tape strip are anchored in place by placing the X-anchoring strips medially. As with ligament taping, the medial X-anchoring strip are centered at the medial joint line with a final vertical anchoring strip (Figure 55). (The medial X-tape strips and vertical strip are NOT placed adjacent to the patella.)

During the process of applying anchoring strips, remember that it is necessary to keep the posterior aspect of the knee open so that tape blisters don't develop. Once the criss-cross X-strips have been applied, the circumferential anchoring strips are applied above and below the knee (Figure 56), as with the ligament taping.

Figure 55: *Medial X-tape strips applied, along with the vertical anchoring strip. This is the same pattern that was shown in figures 26-30.*

Figure 56*: Proximal and distal circumferential anchoring strips.*

This taping method works to stabilize the patella because you now have a medially directed force applied to the border of the patella (Figure 57) as well as the buttressing effect of the tape strips at the lateral border of the patella. In addition, the taping decreases the amount of rotation at the knee joint and the amount of flexion and extension so that the kneecap tends to remain seated in the patellar groove.

All of the treatment methods discussed in this article are only meant as temporary treatments. When the mission is completed, further evaluation and treatment should be sought for the Soldier.

In the next issue, Part 3 will discuss the evaluation and treatment of ankle sprains.

Figure 57: *Mechanical effects of the Y-shaped patellar stabilizing strip.*

This completes Part Two of this article. Part Three will appear in the Summer 2009 edition and will consist of ankle injuries.

JF Rick Hammesfahr, M.D. graduated from Colgate University in 1973 and the College of Medicine and Dentistry of New Jersey in 1977. He was Chief Resident in Orthopaedics at Emory University from 1980-1982. In addition to receiving numerous surgical awards, he has been on the speaking faculty of numerous medical and orthopaedic meetings serving as the co-director of several courses on knee surgery. His publications have focused on tactical medicine, arthroscopy, calcaneal fractures, abductor paralysis, wound healing, running injuries, meniscal repair, septic knees, and sports medicine. He has written two book chapters, one book, published 22 articles, serves on the editoral review board of multiple medical journals, is a chief editor of the "Ranger Medic Handbook," and has presented over 120 CME lectures and talks on orthopedics and sports injuries.

Dr Hammesfahr has served as president of the largest regional orthopaedic association, the Southern Orthopaedic Association. Currently, he is the Director of the Center for Orthopaedics and Sports Medicine and serves as the Chairman of the USSOCOM Curriculum and Examination Board.

Canine Tactical Field Care Part Two – Massive Hemorrhage Control and Physiologic Stabilization of the Volume Depleted, Shock-Affected, or Heatstroke-Affected Canine

Wesley M. Taylor, D.V.M., Diplomate, ACLAM

Abstract

Military and law enforcement agencies have seen a dramatic increase in the utilization of military working dogs (MWDs) and working canine officers, respectively both at home and in foreign deployments. Due to the fact that professional veterinary care is often distant from internal disaster or foreign deployment sites, the military medic, police tactical medic, or other first-response medical care providers may be charged with providing emergency or even basic, non-emergency veterinary care to working canines. The medical principles involved in treating canines are essentially the same as those for treating humans; however, the human healthcare provider needs basic information on canine anatomy and physiology, and common emergency conditions, in order to provide good basic veterinary care until a higher level of veterinary care can be obtained. This article represents the second in a series designed to provide condensed, basic veterinary information on the medical care of working canines, including police canines, federal agency employed working canines, and search-and-rescue dogs, in addition to the MWD, to those who are normally charged with tactical or first responder medical care of human patients. This article focuses on diagnosing and treating some of the more common high-mortality conditions affecting canines in the field including massive hemorrhage, volume-depletion, shock, and heatstroke.

The recent upsurge in the use of working canines as a result of the Global War on Terror has resulted in a need for more veterinary healthcare providers in the field setting.[1-6] The military working dog (MWD) is a critical member of the tactical team or the search and rescue team and as such it is susceptible to similar injuries and conditions as its human colleagues. Whether deployed overseas in support of military missions or at home in support of terrorism events or natural disasters, these canines are becoming casualties at a rate that exceeds the existing veterinary care system capabilities, especially in these deployed situations where it is simply not feasible to have a veterinarian on site with each canine team. Professional veterinary care may be hours to days away from the location of the injured MWD, and providing veterinary care frequently falls to the dog handler, combat medic, or other human healthcare provider.[4,6-8] For this reason, it is critical that non-veterinary healthcare providers be trained in basic veterinary medical skills so that working canines can be returned to work expeditiously.

Analysis of the types of injuries and illnesses experienced by MWDs in deployed situations provides us with a list of common injuries and illnesses experienced by these dogs. Conditions of importance include pad injuries, gunshot wounds, orthopedic injuries, lacerations, common infections, diarrhea and vomiting, volume depletion, massive hemorrhage, shock, and heatstroke.[4,6-8] Some of these conditions are high morbidity and low mortality conditions that are amenable to treatment in the field. Others are high mortality conditions with little chance of treatment success in the field.

Finally, some conditions represent potentially high mortality conditions with the potential of being treated successfully in the field. Of these, volume-depletion, massive hemorrhage, shock, and heatstroke are potentially fatal conditions, yet these conditions lend themselves to the diagnostic and treatment capabilities of those personnel already familiar with field medicine in the human casualty treatment milieu.

These potentially fatal conditions present with cardiovascular abnormalities, and it is essential, that the care provider be able to discriminate one condition from the other by physical exam and basic physiologic signs. For these reasons, this article will focus on differentiating these conditions diagnostically, with the objective of teaching the dog handler or human healthcare provider, to accurately diagnose and treat these conditions with sufficient skill to enable the canine casualty to survive to the next higher level of veterinary care.

Volume Depletion / Dehydration

One of the most common conditions experienced by working canines in the field is volume depletion or dehydration.[9,10] Even during operations in temperate climates, working canines require a significant amount of water in order to maintain physiologically normal hydration. The author has received reports from military veterinarians and canine handlers that dogs working long hours in arid zones can require up to 15L per day in oral rehydration.[8] (Table 1) In any case, adequate hydration is paramount to maintaining normal physiological function, especially during and after severe exertion.

Dehydration can be detected clinically in dogs and can be estimated within the range of 8-15% of body weight.[11] This means that an 85lb (38.6kg) working dog can lose up to 3L of fluids before the resultant dehydration is clinically detectable. This is an important fact for canine handlers and caregivers to remember, as dogs with limited access to fresh water are at high risk of dehydration. In fact, a study of dogs deployed to the World Trade Center and the Pentagon in Search and Rescue (SAR) missions in September 2001 found that dehydration was the third most common problem found in SAR dogs behind minor trauma and weight loss.[7]

Clinical signs of dehydration in the 8-10% range include elevated heart rate of between 90 to 120 bpm at rest, increased skin tent time (decreased skin turgor), and dry mucous membranes. As dehydration worsens to above 10% of body weight, additional clinical signs become evident including "doughy" abdominal palpation, sunken eyes, extended capillary refill time (CRT), possibly "thready" or weak pulses, and in a very severely dehydrated animal, a decrease in metal status may be noted.[11]

It is critical that the canine handler and healthcare team ensure that working canines remain adequately hydrated. Since a dog may need to consume many liters per day of water in extreme environments and under heavy work loads, it can be difficult to impossible for the individual handler to carry sufficient fluids on his person. For this reason, teams must ensure that canine units have access to stores of water during the workday; or that teams be additionally provisioned with individual water purification devices for use in the field.

Table 1: Canine Field Care Card

Parameter	At Rest	Exercise	Drug	Standard Dose	CV Shock Dose
Temperature	100.5-101.5	101.0-104	Crystalloids	2.0-3L/24hr	10-50 ml/kg/hr *
Heart rate	60-75	75-130	6% hetastarch	n/a	5ml/kg bolus up to 20mg/kg total*
Respiratory rate	10-20	30-panting	Morphine	0.5–2mg/kg IM	n/a
Mucous membranes	Pink	Bright pink	Diphenhydramine	1mg/lb q 6-8 hrs	n/a
Capillary refill time	1-2 secs	1 sec	Diazepam	0.1-0.15mg/lb slow IV	Seizures: 0.5mg/lb IV bolus to effect
Pulses	Moderate	Bounding	Fentanyl	1-5mcg/kg/hr IV	n/a
Heart sounds	Behind left shoulder	Sinus arrhythmia except after exercise	Water	Maintenance 2.0-3L/24hr	Exercise 5-15L/24hr
Respiratory sounds	Caudal ½ of thorax	Louder than human	Food	Maintenance 4-6 cups dry / 24hr	Exercise 8-12 cups / 24hr

This table contains normal physiological parameters and physical exam findings for working canines in the weight range of 85 to 110 lbs. The drug doses denoted with an asterisk are from the "Shock" article in the textbook "The 5-Minute Veterinary Consult."[12] Other values are condensed and edited from articles referenced herein and are consistent with those used by this author in private practice on working canines.[4,8-15] This card may be photocopied and laminated for the use of individual JSOM subscribers.

Oral rehydration solutions that contain electrolytes are not recommended for the working canine. As opposed to people, dogs do not have sweat glands on the majority of their skin and most canine body fluid loss is via evaporation from the mouth and airway during panting. This water loss tends to be primarily water, as opposed to the water/electrolyte mix that is lost in humans during sweating.[9,10] For this reason, fluid supplements that are electrolyte rich can cause electrolyte disturbances in dogs, and thus water is the recommended oral rehydration solution for the working canine .

In the event that a working canine is diagnosed with clinically significant dehydration, which means if the dehydration is clinically detectable at all, the canine should be treated by performing intravenous catheterization and providing the dog with replacement fluids in the form of balanced-electrolyte crystalloids, such as Normosol®-R or lactated Ringer's solution. Initial crystalloid fluid replacement for hypovolemia can be given at a rate of up to 10 to 20ml/kg/hr.[11,12]

The required replacement volume can be estimated by multiplying the estimated percent of dehydration by the body weight in kg utilizing the following equation:

IV fluid replacement volume in L = % dehydration x body weight in kg

For example: For an 85 lb dog that is 8% dehydrated

0.08 (percentage dehydrated) x 38.6 (wt in kg) = 3.09L

This 85 lb dog would need 3.09L of replacement fluids given IV over the initial treatment phase (1-2 hrs).

Subcutaneous fluid supplementation is an option as an adjunctive fluid replacement method for mild dehydration. Subcutaneous fluid replacement in dogs is achieved by injecting crystalloid solutions below the skin in the interscapular space on the back. However, only a limited amount of fluid can be delivered in this fashion, perhaps up to one to two liters in a large dog, and the fluids are absorbed slowly from the subcutaneous space. As can be seen from the above calculation, a large dog will need at least three liters of fluids replaced quickly in the event of detectable dehydration, and this is simply too large a volume to be addressed by subcutaneous fluid replacement alone. However, in cases where intravenous access is impractical or impossible, subcutaneous fluid replacement is a viable means of initial treatment for dehydration.[9]

After the dehydration status has been assessed and corrected, it is important for the care provider to remember that ongoing maintenance fluid needs are 50ml/kg/day even in the resting patient at ambient temperatures. So, the 85lb dog in the example above would continue to require 1.93L per day in fluid therapy while in the treatment facility, which must be delivered either orally, subcutaneously, or intravenously.

Shock

Cardiovascular shock is the condition in which blood circulation is shunted away from extremities and large muscles and into the large vessels in the core of the body. It has also been described as failure of the microcirculation and is characterized by reduced tissue perfusion, impaired oxygen delivery, and inadequate cellular energy production.[4,13] Clinical signs of shock include an elevated heart rate, normal to dry but pale mucous membranes, a slow CRT, initially bounding (compensated shock) then rapidly weakening pulses (decompensated shock), and abnormal mentation.[4,12,13] Signs of dehydration may or may not be present, depending upon the hydration status of the patient just prior to entering the shock state.

The most important distinguishing factors in differentiating shock from dehydration is the extended CRT (>2 secs), the weakening pulses, and abnormal and declining mentation. It is important to note that heatstroke patients will have some component of cardiovascular shock, thus in differentiating these two conditions the practitioner must rely upon body temperature and condition of the mucous membranes.[4,12,13] The pale mucous membranes and dry

Table 2: Diagnostic Table for Dehydration, Shock, Hemorrhage, and Heatstroke.

Clinical Sign	Dehydration	Shock	Hemorrhage	Heatstroke
Temperature	Normal (101-105)	101-105	101-105	>106 at rest
Pulse rate	90-120	>120	>70	>120
Pulse rate change	Decreases with rest and rehydration	Increasing rate	Increasing rapidly	Increasing
Pulse quality	Normal	Bounding or weak	Normal then weakening	Weak
Mucous membrane color	Pink	Pale to white	Pink then worsening	Brick red
Mucous membrane moisture	Dry / tacky	Normal or dry	Normal or dry	Hypersalivation
Capillary refill time	Normal (1.0-1.5 secs)	Extended (>2 secs)	Normal then extended	Normal to extended
Respiratory rate	Panting – decreasing with rest and rehydration	Normal to panting	Normal to panting	Panting / unable to stop
Skin turgor	Extended (increasing time with increasing dehydration)	Normal or extended	Normal	Normal
Abdomen	Doughy / sunken Eyes sunken	Normal	Normal (distending in internal hemorrhage)	Full to tight (diarrhea and hematochezia common)

This table can be used as a working reference by the canine healthcare provider to attempt to differentiate the various conditions discussed herein one from another based upon a basic clinical assessment of the canine patient's temperature, pulse rate, pulse quality, mucous membrane color, capillary refill time, respiratory rate, skin turgor, and abdominal palpatation.

mouth of the shock patient contrast dramatically with the bright red mucous membranes and hypersalivation of the heatstroke patient (Table 2).

Treatment of shock should be aimed at restoring normal circulating volume and hemodynamics by treating with intravenous colloids and other volume expanders such as hetastarch, mannitol, or a hemoglobin based oxygen carrier (HBOC) (see below under hemorrhage), combined with careful crystalloid supplementation. Pharmacologic intervention should include the use of "shock" doses of IV corticosteroids and pressor agents.[4,8,12,13]

In the treatment of decompensated shock, crystalloid fluids should be supplemented at a rate of between 10ml/kg/hr and 50ml/kg/hr.[4,12,13] Colloidal expanders such as 6% hetastarch should be given in boluses of 5ml/kg, up to a total dose of 20ml/kg until cardiovascular stability is reached.[4,12,13]

The use of corticosteroids in treating shock is controversial.[13] However, corticosteroids are still considered part of the standard veterinary armamentarium in treating shock. The primary drugs used in treating shock in dogs are methylprednisolone 10-30mg/kg and dexamethasone 4-6mg/kg.[4,8,12,13]

Other supplemental shock treatments include pressor agents to support blood pressure and circulatory function including dopamine 1-10mcg/kg/min IV and dobutamine 5-15mcg/kg/min IV.[12,13] In the absence of blood gas and electrolyte laboratory capabilities, supplementation of potassium (beyond standard electrolyte fluids) and bicarbonate should be avoided, as overdose of either of these compounds can be physiologically destabilizing or fatal.

HEATSTROKE

As mentioned previously, heatstroke in the canine patient was covered in depth in this journal very recently.[4] In an attempt to maintain the integrity of addressing heatstroke in the context of these other diagnostically similar conditions that are amenable to field treatment, it will be discussed again here.

Important predisposing factors to heatstroke in working canines include dehydration, lack of acclimation to a very hot and/or very humid region, previous episodes of heatstroke, long work shifts without adequate time for rest and cooling, long-haired breeds, and the potential for exposure to chemicals such as organophosphates or strychnine in the deployment area.[9,10] It should be noted that these chemicals may be common in some agricultural areas.

The most important clinical sign in differentiating heatstroke from simple dehydration, shock, and internal hemorrhage is the rectal temperature. It is not unusual for dogs in heatstroke to present with a rectal temperature in excess of 108 degrees Fahrenheit (F) and the rectal temperature is often higher than the detection range of a digital thermometer.[4,9,10,14] In many cases, the care provider will attempt to take the rectal temperature of a heatstroke dog only to find the thermometer and any other nearby instruments covered in bloody diarrhea.

The thermally regulating canine will have an elevated body temperature (up to 104-108 degrees F depending upon the breed and reference publication – see Table 1) for a brief period of time immediately after exercise, referred to as exertional hyperthermia; but this patient's temperature will move toward normal after 5 to 15 minutes of rest and panting.[4,9,10] The heatstroke patient's body temperature will not lower in response to rest and panting.

Panting and hypersalivation are common presenting signs in heatstroke, and these signs are absent in canine patients whose body temperature elevation is due to a pyrogenic source (e.g. fever).[14] These signs can also help to differentiate heatstroke from exertional hyperthermia and dehydration, as dehydrated dogs will have dry mucous membranes and will be able to stop panting.[4] Mucous membranes are frequently bright red in heatstroke patients, with the exception that some patients in advanced heatstroke will have pale, dry mucous membranes due to advancing cardiovascular shock.

Dogs in heatstroke, and dogs in shock, will quickly begin to pool blood in the intestinal vasculature. The intestinal mucosa of dogs is quite fragile and quickly sloughs into the intestinal tract under the stress of the severely elevated body temperatures of heatstroke. This sloughing provides a third space for blood and body fluids to accumulate, resulting in rapid cardiovascular shock, disseminated intravascular coagulation (DIC), and death. In many cases, the canine heatstroke patient's abdomen will be distended as a result of the accumulation of blood and body fluids in the intestinal tract. At necropsy, the small intestine will be hugely distended, congested, thin-walled, friable, and contain a foul mixture of intestinal contents, blood, and sloughed intestinal epithelium.

Other sequelae of heatstroke include metabolic acidosis, respiratory alkalosis, hemoconcentration, myocardial necrosis, endotoxemia, cerebral edema, seizures, coma, and acute organ failure, particularly hepatic and renal failure.[14] In all of these conditions, the canine will present with altered or absent mental function, which will be obvious to the care provider. Some dogs in heatstroke vocalize loudly (howling rather than barking), and this can be an indicator of abnormal men-

tal function in the absence of obvious traumatic injury.

Treatment of heatstroke is covered well in the prior JSOM article,[4] and includes rehydration, airway support, treatment of secondary events such as shock, disseminated intravascular coagulation (DIC), and organ failure, and most importantly, the re-establishment of normal body temperature. Cooling of the patient should be attempted via cool water (not ice) baths, IV fluid therapy (subcutaneous fluids if IV access not available) and topical application of alcohol to the footpads, ears, axilla, and groin. It is important for the practitioner to be aware that the canine heatstroke patient has temporarily lost its hypothalamic temperature regulatory mechanism,[14] and cooling of the patient should be discontinued once the body temperature lowers to 103 degrees F.[4,9,10,14] For this reason, the body temperature must continue to be monitored closely throughout the treatment of this condition and its sequelae.

Massive Hemorrhage

Death from blood loss can occur very quickly, in a matter of minutes in the event that an artery is severed, and penetrating trauma capable of causing massive hemorrhage poses a significant risk to the working canine in both military and civilian environments.[4,6,7] The treatment of life-threatening hemorrhage is divided into three categories in the Prehospital Trauma Life Support (PHTLS) healthcare environment, and we will evaluate these same categories of bleeding in the canine patient: compressible, partially-compressible, and non-compressible.

Compressible hemorrhage is that hemorrhage, which occurs in a location such that manual pressure can be applied to an arterial site proximal to the wound to shut off blood supply to the wound. In canine patients, compressible hemorrhage can occur on the ear, the thoracic limb distal to the elbow (Figure 1), the pelvic limb distal to the knee (Figure 2), and the tail.

These locations are amenable to treatment via direct manual pressure proximal to the wound, or via tourniquet. However, it is the author's experience that most tourniquets designed for human patients are too large to be utilized correctly in the canine patient. For this reason, even compressible wounds in canine patients are often treated by pressure dressing applied directly over the wound, as one would treat the partially compressible wound.

Partially-compressible hemorrhages in the canine patient can occur on the thoracic limb between the elbow and the thorax (Figure 3), including the axillary space, on the pelvic limb between the knee and the abdomen (Figure 4), including the groin, on the tailhead, and on the head and neck.

Figure 1: *Thoracic limb distal to the elbow*

Figure 2: *Pelvic limb distal to the knee*

As mentioned above, partially compressible wounds in the canine patient are amenable to treatment via pressure applied directly to the wound and augmented by a pressure dressing applied over the site. Bandages should be applied tightly to these locations and natural anatomical features such as the wing of the ilium (Figure 5) should be utilized as fulcrums in the bandage pattern. A figure-8 bandage can be applied to the pelvis or the thorax of a working canine, but most dogs will require at least five yards of bandage material in order to complete a bandage of this size.

Non-compressible wounds in canine patients are those that occur in the abdominal or thoracic areas. These wounds, as in the human patient, are not amenable to bandaging or tourniquet placement. In some cases, the care provider can see or feel the source of bleeding and apply digital pressure or a hemostat directly to the bleeding vessel. But in most cases, massive hemorrhage in these anatomical areas will result in death of the canine patient in just a few minutes' time, despite the best efforts of the medical care team.

Figure 3: *Thorasic limb proximal to elbow*

Figure 4: *Pelvic limb proximal to knee*

Figure 5: Wing of the ilium

Elastic bandages should be used preferentially, as non-elastic bandages (especially cotton) will expand when wet and may slip from the wound, resulting in failure of the application. Elastic bandages with factory-applied adhesive (Figure 6), are of most effect in applying pressure dressings to canine patients, as the funnel-shaped upper limbs and ventro-dorsally narrow thorax and abdomen tend to cause non-adhesive bandages to bunch up and slip from their original location. Elastic bandages can also be applied on top of a synthetic bandaging tape such as shown in Figure 7, to help hold the bandage application in place.

Canines can be treated with the same hemostatic agents as human casualties. The author has used hemostatic gauze (Figure 8) in canine patients with good hemostatic results. There is a canine version of a hemostatic agent (Figure 9), available in an over-the-counter (OTC) formulation for use in pet dogs and cats. The canine version of this agent is a 25g package that comes in a sealed foil pouch.

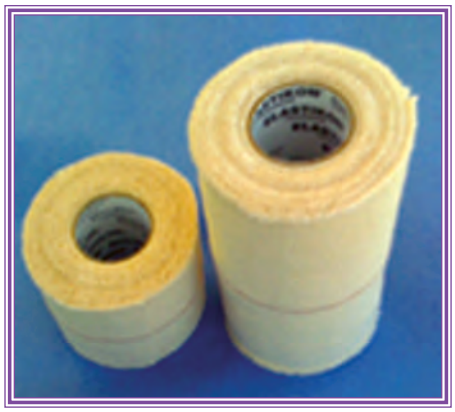

Figure 6: *Elastic bandage 2" and 4"*

The PHTLS manual has an extensive discussion and analysis of the use of intravenous fluids, both crystalloid and colloidal fluids, to treat hypotension from

Figure 7:
4" Bandaging tape

hemorrhage in the pre-hospital human patient.[16] Due to significant similarities in the cardiovascular system of the canine and the human patient, this analysis and the associated findings hold true for the canine patient; namely, that fluid resuscitation of the massive hemorrhage patient should be delayed until after hemostasis is achieved and the patient is under evacuation to a higher level of care.

Figure 8: *Hemostatic gauze*

Figure 9: *Canine hemostatic agent*

Once the hemorrhage is controlled and the canine patient is evacuated to a higher level of veterinary care, fluid resuscitation can be addressed in a fashion similar to that noted above for treating dehydration. Standard intravenous fluid products for human patients are utilized in canine patients, including crystalloids such as lactated Ringer's solution (LR), or normal saline (0.9 % NaCl in water), as well as colloidal products such as 6% hetastarch and mannitol.[4,6-15] In addition, there is an FDA-approved hemoglobin based oxygen carrier (HBOC) for the canine patient that is an octamer of the bovine hemoglobin molecule and has been shown to be safe and effective for canine trauma patients over several years of use in veterinary practice in both the United States and Europe.[17] The standard shock dose of the HBOC can be used to support both fluid volume and blood pressure in the canine patient, without the requirement of canine blood typing.

Blood transfusions between dogs are possible at higher levels of veterinary care. Standard human blood sets and citrated collection vials can be utilized to collect and transfuse the sample from one patient to another. While the details of canine blood typing and blood transfusions would occupy an additional paper, the author would like to point out that due to the limited range and distribution of blood types in canines (approximately 50% of dogs are positive for the most important canine antigen DEA 1.1), the lack of alloantibodies in dogs, and the unlikelihood of prior transfusion in a given dog, a one-time transfusion between two dogs can be achieved under relatively austere conditions, with limited risk of transfusion reaction in the recipient dog.[18] This is, in fact, a common occurrence in private veterinary practice in locations distant from a canine blood bank. The use of HBOC is preferred for treatment of canine patients with acute hemorrhage blood loss,[17] given the fact that the HBOC is stable for long periods of time at a large range of temperatures and does not require cross-matching or cause mismatch transfusion reactions.

Vascular Access

All of the conditions discussed in this article require vascular access in order to provide definitive treatment. The veins of working canines are usually prominent and a skilled medical practitioner will be able to place an intravenous catheter with ease in the canine patient. The most accessible veins for intravenous catheterization include the cephalic vein on the thoracic limb (Figure 10), the saphenous vein on the lateral surface of the pelvic limb (Figure 11), and the

Figure 10: *Cephalic vein*

external jugular vein on either side of the neck at the jugular furrow.

The cephalic and saphenous veins are of sufficient size in all working canines that they can accommodate a 20ga x 1.5" catheter. These veins are large enough for 18ga or 16ga catheters in some large, lean dogs. The jugular veins should be of sufficient diameter to accommodate anything smaller than a 14ga catheter.

Figure 11: *Saphenous vein*

Catheters can be taped in place using standard 1in. athletic tape. In ideal situations, the leg would be clipped of fur and the leg prepped with surgical disinfectant prior to IV placement. In situations where clippers are not available, the skin and fur can be disinfected with rubbing alcohol or surgical disinfectant without clipping. Soap-containing solutions should be avoided in this instance, as these will result in a slippery hair surface that will not hold tape.

Standard heparin-locks and intravenous fluids and lines can be utilized for the canine patient as discussed above.

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Author's Conflict of Interest Statement: Part of my veterinary practice involves the sale of some of the products mentioned in this article to clients and to other veterinary healthcare practitioners. These include Elastikon®, Vetrap™, PetClot®, and Combat Gauze™. This activity represents significantly less than one percent of my practice's gross sales and thus does not represent a significant financial conflict of interest.

Dr. Wesley M. Taylor holds degrees from Rice University (BA 1988) and Texas A&M University (DVM) and is a Diplomate of the American College of Laboratory Animal Medicine. He has served as the Assistant Director of Laboratory Animal Medicine at the University of Mississippi Medical Center and as the Chairman of Primate Medicine and Surgery at the New England National Primate Research Center, Harvard Medical School. During this time, he also served as an officer in the Mississippi Air National Guard. For the last 10 years, Dr. Taylor has been in private practice in the north Texas area, where he practices general and emergency veterinary medicine and surgery, and serves as a veterinary consultant at the Texas Research and Education Institute (TREI) and at the University of North Texas Medical Center. Dr. Taylor has over 16 years of experience with working canines and lectures frequently to law enforcement groups on emergency medicine and surgery of the canine officer, and he serves as a veterinary consultant to several Texas area law enforcement agencies. Dr. Taylor serves as veterinarian and instructor in Tactical Combat Casualty Care (TCCC) training courses held for the Operational Medicine Fund of the Presbyterian Healthcare Foundation and for Advanced Medical Training.

A Case of Reactive Arthritis in a Ranger Indoctrination Program (RIP) Student

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Abstract

Musculoskeletal complaints comprise the majority of cases encountered by military physicians when evaluating young active duty Soldier-athletes. This is a case of reactive arthritis in a 19-year-old active duty Soldier-athlete whose failure to improve with conservative therapy initiated further investigation. When evaluating what appear to be routine overuse injuries, it is important to actively include other potential causes of musculoskeletal complaints in the differential diagnosis.

Further investigation of disease in patients whose symptoms and complaints do not improve with routine conservative care is paramount. Reactive arthritis, though self-limiting in two-thirds of those affected, can become a chronic disabling disease affecting as many as 40 out of 100 patients. Current theories suggest the persistent presence of non-culturable bacteria and bacterial antigens residing in the joint synovia as the etiology of the disease state. There is no curative therapy for reactive arthritis and management is focused on the treatment of symptoms with non-steroidal anti-inflammatory drugs (NSAIDs), immunomodulator therapy, and antibiotics if an infectious source is suspected.

Case Presentation

A 19-year-old active duty white male Ranger Indoctrination Program (RIP) student with a history of bilateral patello-femoral knee pain during high school athletics presented to the Regimental Aid Station with a four-week history of continuous aching bilateral knee pain that worsened with weight bearing and was accompanied by large bilateral knee effusions. The Soldier recently graduated from basic training and the basic airborne course; however, he denied any history of knee or lower extremity trauma or pain during his training. Four weeks prior, the patient was evaluated at the Troop Medical Clinic and treated for bilateral patello-femoral pain syndrome with NSAID and ice therapy. Symptoms progressively worsened and the patient was placed on crutches and a low impact activity profile. His super-

Figure 1: *19 y/o male with bilateral atraumatic knee effusions*

visors became concerned about his ongoing symptoms and contacted the Ranger Medical Treatment Facility requesting a second evaluation.

During further investigation, the patient described recent urinary tract infection symptoms to include dysuria and increased frequency of urination approximately four weeks prior to the development of bilateral knee pain. The patient denied fevers, loose-watery stools, urethral discharge, skin lesions, or other joint pains. The patient reported recent casual unprotected sexual intercourse prior to the dysuria and increased frequency and was treated for a "urinary tract infection" at the local Army community hospital with levofloxacin. The urinalysis obtained during this time revealed a white blood cell count of 395, 28 red blood cells, and positive leukocyte esterase; however, no urethral or urine culture was obtained. The patient reported successful resolution of his "urinary tract infection" symptoms after completing the prescribed antibiotic therapy.

The patient was noted to have an antalgic gait (a limp adopted to avoid pain on weight-bearing structures, characterized by a very short stance phase) with pain greater than expected for patella-femoral syndrome. During examination of the lower extremities, bilateral non-erythematous tender knee effusions with warmth to palpation were observed. The patient exhibited mild generalized pain with passive and active range of motion and weight bearing. The patient demonstrated pain and limited range of motion of the knee with flexion bilaterally. Tests for ligamentous and meniscal injury were negative. Urethral discharge, inguinal lymphadenopathy, and epididymal tenderness to palpation were absent. The patient had normal vision with normal light reflex and no photophobia, conjunctivitis, or drainage was observed. No skin lesions or rash were found. Normal range of motion of the spine was present.

Bilateral knee joint aspiration was performed revealing a white blood cell count of 8,389, no red blood cells, negative gram stain, and no visualization of crystals. Initial x-rays of the knees revealed bilateral moderate sized joint effusions with no evidence of tumor, arthritis, or osteochondral abnormality. The erythrocyte sedimentation rate was 98 and the C reactive protein was 16.5. The urinalysis performed during subsequent examination was normal with no gross hematuria or pyuria. The remainder of the laboratory tests revealed a positive human leukocyte antigen (HLA-B27) (associated with inflammatory disease), negative antinuclear antibody test (ANA) (measures the amount and pattern of antibodies in your blood that work against your own body – autoimmune reaction), no growth of the arthrocentesis culture (joint aspiration), and negative urethral culture for gonorrhea/chlamydia. Samples for hepatitis and human immunodeficiency virus (HIV) were also drawn to evaluate for other possible sexually transmitted diseases and noted to be negative.

The elevated white blood cells count on arthrocentesis, with negative aspirate cultures, and a positive HLA-B27, associated with a prior clinical history of a urinary tract infection favored the diagnosis of reactive arthritis secondary to suspected urethritis. Following the completion of laboratory studies, the patient received bilateral corticosteroid intra-articular injections, and the patient's symptoms improved over the following days. The patient was referred to physical therapy and was prescribed indomethacin. The patient was also placed on a modified profile (relieved from heavy physical and high-impact activity and placed on bed rest and light duty) and instructed to follow-up daily for re-evaluation. The patient was referred to a local rheumatologist for suspected reactive arthritis.

Interval knee films, six weeks later, revealed continued moderate joint effusion and mild demineralization of the metadiaphyseal junction with no signs of erosive arthritis. Lumbar spine x-rays were normal with no signs of ankylosis. Pelvic x-rays showed no evidence of erosive arthritis or sclerosis.

The historical, clinical, and laboratory findings were most consistent with a reactive arthritis and a presumptive diagnosis was made.

Reactive Arthritis

Reactive arthritis is a systemic rheumatologic disease that usually develops after a recent infection and falls within the category of seronegative spondyloarthropathies which includes: ankylosing spondylitis, psoriatic arthritis, and the arthropathy of inflammatory bowel disease.[1-3] The condition typically follows either an enteric or urogenital infection and is characterized by an acute nonpurulent arthritis. Currently, no single diagnostic test exists for reactive arthritis nor have experts universally agreed upon clear clinical and laboratory criteria defining the disease.[4] The American Rheumatism Association criteria committee defines the syndrome as a peripheral arthritis lasting greater than one month and associated with urethritis, cervicitis, or both.[5] The presence of asymmetric oligoarthritis (predominantly lower extremity), sausage-shaped finger or toe (dactylitis), toe/heel pain, enthesitis (inflammation at the site of tendon origin or insertion in bone), cervicitis, conjunctivitis, iritis, genital ulceration, or urethritis on physical exam supports the diagnosis.

Reactive arthritis, formally known as Reiter's syndrome, was described in early medical literature as

early as the times of Hippocrates and was first formally diagnosed in 1818 by Sir Benjamin Brodie who described the classic symptoms of urethritis, conjunctivitis, and arthritic symptoms. In 1916, Dr. Hans Reiter reported the relationship between urethritis and the development of uveitis and arthritic symptoms in a single case identified in a German soldier. During that same time, the classic description of an arthritic syndrome following urethritis, conjunctivitis, and enteritis was also reported by doctors Feissinger and Leroy of France.[6] Though referred to as Feissinger and Leroy syndrome in France, Reiter's syndrome became the popularly accepted name of the syndrome after being described in American medical literature by doctors Walter Bauer and Effrain Engelman. Today the term Reiter's syndrome, has fallen out of favor within the medical community due to Hans Reiter's unethical medical practices and experiments performed on concentration camp prisoners during his service for the German Nazi Party in the 1930s and 1940s. Instead, the term "reactive arthritis" is recognized by the medical community to describe the syndrome.[6]

The frequency of reactive arthritis varies greatly among different populations, races, geographic locations, and sources of disease (enteric is more common in developing nations while urogenital is more common in the developed countries). The prevalence of reactive arthritis has been reported to range between 4.6 and 13 per 100,000 people for the urogenital derived disease and 5 to 14 per 100,000 people for the enteric derived disease.[6] The HLA-B27 genotype is associated with reactive arthritis and carries a significantly increased risk of developing the disease following a urogenital or enteric infection.[4] It has also been noted that specific populations, such as certain Native American tribes, have a higher prevalence of HLA-B27 genotype and therefore, have a higher frequency of reactive arthritis.[1] It is suspected that the incidence of reactive arthritis is underestimated by as much as 40% due to the under-reporting of chlamydial infection.[1] This disease is most common in individuals between 18 to 40 years of age and rarely affects children.[7] The urogenital form of reactive arthritis is more common in males than females with a ratio of 9:1 while the enteric form has been reported to affect males and female equally with a 1:1 ratio.[6] The classic triad is rare occurring in only 5% of patients and is defined by the presence of arthritis, conjunctivitis, and urethritis.[2]

The onset of reactive arthritis typically occurs one to four weeks after an initial urethral or gastrointestinal infection. The presence of urethritis is often asymptomatic in women; however, males usually present with urethral discharge or dysuria. In some patients, hematuria may be the only symptom.[8] Conjunctivitis is most likely to be mild and bilateral in nature and is more prevalent following genitourinary or Shigella-associated infection.[3,6] Conjunctival cultures are negative and the conjunctivitis normally resolves in approximately 10 days without treatment. Anterior uveitis occurs in five percent of patients and is most often acute, unilateral, and recurrent. Oligoarthritis is most frequently seen in the lower extremities and onset usually occurs rapidly, often times resulting in large effusions. Smaller joints of the wrists and fingers may also present with similar symptoms.[6] Inflammation may involve ligaments and tendons, otherwise known as enthesopathy, at sites of insertion of the achilles, patellar, and quadriceps tendons (in order of prevalence). The duration of arthritis is quite variable and most patients recover within one year; however, others develop chronic complications. Recurrence of symptoms ranges from 15 to 30% and most commonly occurs after the urogenital form of disease.[2] Low back pain is a common symptom secondary to spondylitis and inflammatory asymmetrical sacroiliitis.[3] Skin lesions that are histologically similar to psoriasis may be present. Keratoderma blennorrhagica begins as clear vesicles on a red base and progresses to flat macules, papules, or nodules found on the soles, palms, and mucus membranes. Balanitis circinata presents as painless penile ulcers on the glans and shaft of the penis.[6] Painless oral ulcers have also been associated with reactive arthritis.[6] Other symptoms such as fever and weight loss can be significant. Cardiac involvement is rare but, when present, can include aortic valvular insufficiency and conduction disturbances leading to heart block.[3]

Serum laboratory studies often reveal a nonspecific anemia, elevated erythrocyte sedimentation rate, and elevated C reactive protein.[6] Patients may exhibit a slight neutrophilic leukocytosis. Urethral swabs may be performed to evaluate for chlamydia, but direct florescent antibody, enzyme immunoassay, polymerase chain reaction (PCR), ligase chain reaction (LCR), or a probe for ribosomal ribonucleic acid (rRNA) are more accurate as cultures are unreliable and a negative culture does not rule out an ongoing reactive process.[9] Following a history of diarrhea, stool cultures should be obtained to determine the infectious agent. Joint fluid examination reveals inflammatory synovitis with 15,000-30,000 white blood cells per millimeter, with a predominance of neutrophils.[8] Joint aspirate is negative for crystals, cultures are negative, and glucose count is normal.[6] Plain films generally are unremarkable with the exception of an effusion. Juxtaarticular osteoporosis, erosions

with indistinct margins, may be noted. In addition, unilateral or bilateral sacroiliitis may be noted with asymmetric paravertebral comma-shaped ossification involving the thoracic or lumbar spine.[3] Synovial biopsy can be informative but not practical for acute treatment. Biopsy findings may include Reiter cells (macrophages with vacuoles containing nuclear debris and white blood cells), nonspecific inflammatory changes, infectious antigens, and *Chlamydia trachomatis* organisms (found utilizing in-situ hybridization) in the synovial tissue.[6,10] In addition, antichlamydial antibodies have been demonstrated in serum.[9]

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of an atraumatic knee effusion includes infectious processes from hematogenesis seeding of the joint, reactive arthritis, psoriatic arthritis, autoimmune polyarthritis (i.e. rheumatoid arthritis, juvenile rheumatoid arthritis, systemic lupus erythematous, sarcoid arthritis), crystal-induced arthritis (gout or pseudo-gout), coagulopathy (hemophilia), sickle-cell disease, neoplasia (benign or malignant tumors) and osteoarthritis.[4,6,8,10,11]

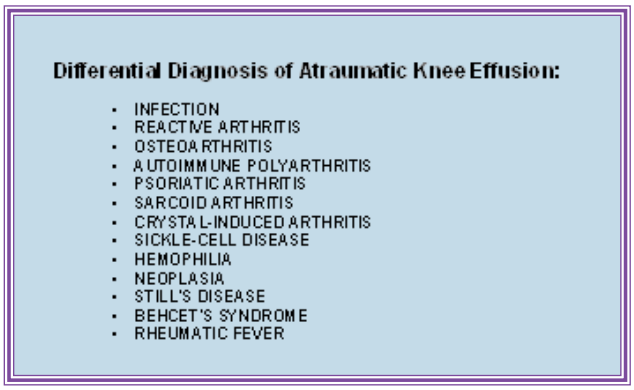
Though infectious arthritis is possible with hematogenous spread of many microorganisms to a bony joint, the most common causes of infectious arthritis in young, sexually active populations is gonococcal in origin.[12] It is associated with the formation of a pustule with an erythematous base and is often associated with a migratory polyarthralgia involving the small joints of the hands and wrists.[6,8,12]

Autoimmune arthritis usually presents with an insidious onset associated with other systemic signs and symptoms such as skin and mucous membrane lesions and multiple symmetric joint involvement.[8] Clinical suspicion is often confirmed by the presence of positive auto-immune markers.

Gout and pseudo-gout arthritis often presents with similar symptoms as reactive arthritis but usually involves only one joint, presents and resolves acutely, and is confirmed by the presence of crystals in the joint aspirate.[12,13]

Blood dyscrasias, such as sickle-cell disease and coagulopathy, can be confirmed by a prolonged prothrombin time (PT) or partial thromboplastin time (PTT), the absence of specific coagulation factors or serum proteins and prolonged bleeding times, and hemoglobin electrophoresis. Often a bloody fluid collection is present on aspiration of the joint space indicating hemarthrosis.

Though rare, Still's disease (a disease of unknown etiology characterized by recurrent fever, arthritis, and rash), Behcet's syndrome (a disease of unknown etiology characterized by mucocutaneous ulcers and polysystemic inflammatory manifestations to include arthritis), and rheumatic fever must also be considered in the differential diagnosis.[6,8]



CAUSATIVE ORGANISMS

Multiple organisms can trigger reactive arthritis but the condition usually follows a genitourinary infection or infectious enteritis. The most common urethral organism is *Chlamydia trachomatis*. Gonococcal venereal disease, however, has been implicated as a causative organism.[8] Other genitourinary pathogens include ureaplasma.[6] The most common causative organisms of enteritis induced reactive arthritis include *Salmonella*, *Shigella*, *Campylobacter*, and *Yersinia*.[14] Other infectious organisms such as *Clostridium difficile*, Lyme disease (*Borrelia burgdorferi*), *Brucella*, beta-hemolytic *Streptococcus*, parvovirus, HIV, and rickettsia are believed to be possible culprits. In addition, parasites such as strongyloids and amoebae, have been suspected.[6]

PATHOGENESIS

Current theories on the pathogenesis of reactive arthritis postulate the cause of reactive arthritis is from the persistent presence of non-culturable bacteria and bacterial antigens residing in the joint synovia or other tissues of the body.[6] These metabolically active non-culturable bacteria continue to illicit a local immunological and inflammatory response by the host despite resolution of the initial acute infection.[6,10] The presence of mitochondrial (mRNA) and rRNA of *Chlamydia trachomatis* identified by PCR techniques using biopsied synovia has been demonstrated in multiple patients. These findings suggest the continued presence of metabolically active infectious organisms that continue to produce bacterial antigens triggering an immune response. It is thought that monocytes are likely involved in the transportation of chlamydia from the genitourinary tract to the synovium

and the persistence of chalmydiae species may be a result of an impaired T-cell response to infection.[6,10,14] In other studies of biopsies of synovial tissue or synovial fluid, the presence of antigens from enteric pathogens has been identified using immunohistochemistry techniques.[6,14] This may indicate persistent infection of the gastrointestinal tract by these organisms and intra-cellular transport of the bacterial antigens to the intraarticular space via monocytes.[6,10]

Reactive arthritis most often occurs in genetically predisposed persons. The major serological marker is HLA-B27 and is present in nearly 50% of patients.[4] If negative for HLA-B27, persons may be positive for cross-reactive human leukocyte antigens such as B7, B22, B40, and B42.[8] Recent studies reveal similar peptide binding sites on gram negative organisms and B27 molecules.[3,6,8,14] Current theories suggest this molecular mimicry may produce a serological cross-reactivity thereby allowing tolerance of the foreign pathogens by the host immune system.[6,14] Some theories suggest HLA-B27 inhibits the host's ability to clear infected macrophages which could lead to persistent infection and possible dissemination of infectious agents. Other theories postulate an impaired immune response and the inability to clear infected macrophages in some predisposed subjects with HLA-B27 marker.[6]

COURSE

The course of reactive arthritis can be highly variable ranging from a short, self-limiting process to a continuous, unremitting and progressive disease state. Reactive arthritis was once considered a benign, self-limiting condition. The average disease duration has been reported to be between three and six months; however, up to 20% of patients report symptoms at 12 months post initial symptoms.[4] A cohort study of 432 Ontario (Canada) policemen who developed acute gastroenteritis secondary to *Salmonella typhimurium* food poisoning revealed that 27 patients developed reactive arthritis and 18 remained symptomatic five years after the inciting event.[8] Several patients were forced to seek new employment secondary to continued arthritic symptoms. Of the 18 patients with persistent symptoms, 14 continued to exhibit axial disease including sacroiliitis and spondylitis. In another study, 40 of 100 patients developed chronic disability 25 years after the onset of disease.[8]

TREATMENT

Currently no curative treatment exists for reactive arthritis. Approximately two thirds of persons will have a self-limiting disease. Primary treatment consists of high dose oral NSAIDs such as Indocin.[2,3,6,8] Cyclooxygenase-2 (COX-2) inhibitors may be beneficial and better tolerated due to their lower gastrointestinal side-effect profile. Though useful in some of the other spondyloarthropathies, no evidence suggests treatment with oral corticosteroids is effective.[14]

Antibiotic therapy is indicated for the treatment of chlamydial disease and has been shown to decrease the incidence of reactive arthritis in individuals receiving early intervention during acute infection.[2,6,14] For recurrent urethritis in patients with a history of reactive arthritis in the past, erythromycin and tetracycline therapy have been shown to reduce recurrence rates to 10%, versus 37% recurrence in untreated individuals.[8] Another study evaluating the effects of prolonged antibiotic therapy using lymecycline for a period of three months in individuals with reactive arthritis secondary to chlamydial infection revealed a decreased duration of disease symptoms in 50% of the patients being treated.[6,8,15] However, it was noted that long-term lymecycline therapy did not change the natural course of the disease and musculoskeletal complaints were common in the majority of patients treated.[15] Short-term use of antibiotic therapy in individuals who have already developed reactive arthritis secondary to a chlamydial infection has generally been considered ineffective.[6,14] When treating chlamydia, it is important to appropriately treat the sexual partner of the affected individual.

Utilizing antibiotic therapy to treat enteric infections has been ineffective in the prevention of reactive arthritis and has not been shown to decrease the length or recurrence of disease.[6,8,14] One study revealed an exception: ciprofloxacin treatment of enteritis caused by *Yersinia* prevented reactive arthritis but did not change the disease prognosis if administered after reactive arthritis had already ensued.[8]

Intra-articular corticosteroid injections may temporarily improve symptoms in patients with mono or oligo-articular disease.[6,14]

For patients with reactive arthritis refractory to first line therapy, disease-modifying anti-rheumatic drugs (DMARDs) are indicated.[6] The utilization of sulfasalazine (azulfidine) appears to be effective for the persistent disease state.[6,8,14] Patients with physical or radiologic findings of arthritis or sacroiliitis may benefit from immuno-suppressive medications such as methotrexate or azathioprine (Imuran) therapy.[3,6,8,14] Recently, new treatments have included etanercept and infliximab which suppress tumor necrosis factor, a protein involved in the immune response cascade, and show promising results though large studies have not been performed.[6] Immuno-suppressive therapy should be

managed by a rheumatologist. Bed rest may be counterproductive and a gradual increase in physical activity, to include walking, swimming, and range of motion exercises may reduce stiffness and improve flexibility. Persistent symptoms and failure to respond to therapy should lead to testing for human immunodeficiency virus as reactive arthritis is often the presenting symptom.[8]

Prognosis

The majority of patients become asymptomatic after six months, but symptoms may continue to present after 12 months. The 20-year prognosis of reactive arthritis is determined by four major factors: the nature of the triggering infection, the presence of HLA-B27, the patient's gender, and presence of recurrent arthritis. Overall, a relapsing course appears less common in enteric-related disease than in chlamydia-associated reactive arthritis. HLA-B27 is associated with chronic disease and bears a less favorable prognosis. Male gender is associated with a poorer prognosis. Other predictive factors that may occur during the first two years and are associated with a poor prognosis include: hip arthritis, erythrocyte sedimentation rate > 30mm/h, poor response to NSAID therapy, limited range of motion of the lumbar axis, dactylitis, oligoarthritis, and onset of disease prior to 16 years of age.[6] As noted above, the likelihood of permanent disability is high and it is not possible to predict outcome. Per 2007 U.S. Army fitness standards for retention, Army personnel diagnosed with the condition must undergo a medical evaluation board (MEB) and will likely be medically discharged as this condition is disqualifying for military service.[16]

Conclusion

Though most musculoskeletal complaints in the young active duty Soldier-athlete stem from mechanical and overuse injury, it is important to remain vigilant for other causes of disease especially when symptoms do not improve with initial conservative therapy. This case of reactive arthritis illustrates the importance of further investigation, identification, and treatment of a Soldier-athlete with progressively worsening knee pain despite conservative therapy.

Figure 2: *Follow-up right knee x-ray revealing mild demineralization of the metadiaphyseal junction with no signs of erosive arthritis*

Figure 3: *Follow-up right knee x-ray revealing mild demineralization of the metadiaphyseal junction with no signs of erosive arthritis*

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Functional Training Program Bridges Rehabilitation and Return to Duty

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Abstract

Traditional clinic-based rehabilitation programs often fall short of returning Soldiers to peak condition prior to releasing them for duty. With the higher physical demands placed on the Special Operations Soldier, a bridge program offers rehabilitation professionals a way to maximize recovery, enhance performance, and hopefully prevent injuries (or re-injury). A six week functional training program is outlined and data collection from over two years is presented. Statistically and operationally significant differences were noted in nearly every category tested. Functional Movement Screen™ scores improved an average of 2.5 points. T-test improvement was 0.5 seconds. Single leg hop time improved 10%. Hop for distance improved approximately 10%. Body fat improvement was statistically significant. Kip-ups improved 32%. Vertical jump height improvement was statistically significant. All subjective fitness category self-evaluations demonstrated statistically significant improvements, except for pain. Data suggests that a program like this may be beneficial to patients and non-patients seeking a safe, effective alternative training regimen.

Introduction

Previous injury and incomplete rehabilitation have been identified as risk factors for re-injury.[1] Supervised rehabilitation in various forms has been shown to prevent lower extremity and spinal re-injuries in several populations.[2-6] In an effort to connect traditional rehabilitation and return to full duty, we offer a functional training program to our patients. In the military medical setting, these programs take patients beyond traditional clinic-based rehabilitation and help to fill the void left when a Soldier leaves the physical therapy clinic and returns to his unit/team. Our program has existed at Fort Bragg, NC, for over two years. This manuscript will outline the rationale, design, and data collected from a USASOC evidence-based functional training program (FTP).

Program Outline

There are three goals of our program: 1) to serve as a stop-gap between clinical rehabilitation and return to duty; 2) to enhance performance, and; 3) ultimately, to prevent injuries. In an effort to design a program that provided the most benefit for active duty Soldiers, a variety of techniques were employed. The program has evolved to become an eclectic combination of methods, exercises, and techniques borrowed from nationally recognized subject matter experts in the rehabilitation and fitness professions. Some of these professionals include Don Chu, Gray Cook, Greg Glassman, Stuart McGill, Mark Rippetoe, Mark Verstegen, and Kevin Wilk to name a few.[7-14]

Participation is 100% voluntary, but patients who are about to be discharged from physical therapy following extensive rehabilitation are strongly encouraged to participate. The FTP is designed to prepare them for returning to full duty, resuming airborne jump status, and deployment to combat zones. Other participants are healthy individuals who have not been patients in the clinic. They appreciate the value of this type of training and seek to enhance their own physical performance or prevent future injuries.

Each FTP cohort meets three times per week for six weeks in duration. Classes are 75 minutes in duration to include warm-up and cool down. We have found that

running the classes prior to the duty day and cafeteria breakfast hours on Monday, Wednesday, and Thursday works best in our population. On Mondays, the focus is agility training, Wednesdays target core strength and balance, and Thursdays we work on power and explosiveness.

Along with the three organized group workouts each week, participants are given an individualized strength and conditioning program based on their personal goals and/or strengths and weaknesses. Prior to the start of the program, potential participants complete a subjective questionnaire (Appendix A) evaluating their confidence with a variety of fitness parameters. Additionally, they are asked about their personal fitness goals in order to better design an individualized strength and conditioning program to meet their needs. For instance, if a Soldier wants to lose 10 lbs, their cardiorespiratory and strength training program will look much different than someone who is trying to bulk up and gain 10 lbs. A one week example of a weight loss program (Appendix B) and a lower extremity strength/weight gain program (Appendix C) are provided.

Education is a cornerstone of the FTP. We strongly recommend all participants meet with a registered dietician from Womack Army Medical Center for at least one hour after completing a three to five day food diary. The information received during this session is invaluable in assisting participants to nutritionally augment their fitness and performance goals. In addition to the education they receive from the dietician, we focus every class session on teaching such principles as the importance of a dynamic warm-up, proper mechanics of movement, recovery techniques, and utilization of the trunk and core musculature to produce power and to prevent injuries.

Each 75 minute class session consists of a 15 minute dynamic warm-up, approximately 30 minutes of focused training specific to the day of the week as previously mentioned, 15 minutes of prehabilitative core work (exercises designed to prevent injuries),[8, 12, 15-20] and 15 minutes of cool down at the completion of each class. Since performing static stretching prior to sprinting or jumping has been shown to decrease performance,[21-26] a dynamic warm-up is used.[12, 27] The warm-up consists of 10 dynamic stretching exercises: cervical rotations; shoulder rotations to the front and rear; trunk rotations to a static lunge stance; walking lunges to the front, rear, and each side; walkouts; and alternating high knee walks for one length of a 40′ x 20′ racquetball court; and concludes with sumo squats and calf raises .[8, 12]

Immediately upon completion of the warm-up, the day specific exercise begins. On Mondays, the focus is on improving agility through a variety of quick feet drills conducted inside and outside on a grassy field with using agility ladders, cones, hurdles, and discs.[27, 28] To some extent everyday, but particularly on Wednesday, the focus is on the core musculature (i.e. large hip muscles, paravertebrals, transverse abdominus, periscapular musculature, and rotator cuff) and balance development.[7, 10, 12-18, 29-40] We utilize medicine balls and free-form resistance to assist in recruitment of core musculature for strength and balance development.[35, 41] Thursdays, the focus is on improving power and explosiveness through utilization of the core to perform bounding, hopping, jumping, and throwing.[28] In addition to utilizing complex training,[42] and depth jumps,[43] most individualized strength programs include one or more Olympic or power lifts[11] in an effort to improve lower extremity power and improve vertical jump height.[44-46] Classes begin at a basic level with an emphasis on proper form for all movement patterns. After a week of "crawling" we transition to the "walking" phase for weeks two and three prior to the "running" phase of the program for weeks four through six. See Appendices D, E, and F for a sample weeks one, three, and six.

Some form of prehabilitative core development is done at the end of each workout prior to the cool down. Various physioball exercises, planks, and other yoga or pilates exercises are utilized in an effort to clear lactate and enhance postural control.[47] Upon completion of the core development module, the cool down begins.

The cool down period consists of five minutes of foam roll use followed by 10 minutes of stretching. The foam roll is a type of self massage we utilize on the hips, thighs, and back.[12, 48-50] Stretching is performed using three bouts of contract-relax stretching[51-53] followed by 30 second static holds for hamstrings and hip flexors/quads using a stretch strap.[54-56] Ten prone press-ups are performed for lumbar disc maintenance.[57, 58] A side-lying posterior shoulder capsule stretch[59, 60] (Figure 1) is performed in addition to a 90° and 120° pectoralis stretch standing against a wall to improve posture and positioning of the humeral head within the glenoid fossa. Gastroc and soleus stretches are also done leaning against a wall. All static stretches are held for 30 seconds.[54-56] Static stretches are only performed at the completion of the workout with a goal of improving flexibility and joint range of motion.

At the completion of the six week program, participants are given a bag which contains material to assist them with performing similar exercises at home or while traveling. The bag includes a physioball, a

Figure 1: A side-lying posterior shoulder capsule stretch

foam roll, a stretch strap, a copy of Core Performance,[12] mini-bands, thera-tubing, and an agility ladder. In the event a participant must leave the program due to work constraints prior to the completion of six weeks, the bag and a copy of the workout program allows the participant to follow along with most of the exercises.

Data Collection

As part of an ongoing evaluation and validation of the FTP, we began collecting data with our first class in August 2006. This data sample represents participants from August 2006 to December 2008. 155 participants attempted the program and 65 participants dropped out of the training or were lost to follow-up resulting in complete data on 90 participants. Due to the nature of our current military OPTEMPO, it is difficult for individuals to commit six full weeks of training, and job requirements often precluded their ability to complete the training and testing. Dropouts were not included in the statistical analysis.

The data set included 80 males and 10 females. The mean age of participants was 35 yrs (± 5.0 yrs) with a mean weight of 88.2 kg (± 7.1kg).

Performance testing included the Functional Movement Screen™(FMS), functional tests of power, speed, balance, and core strength, and body fat testing. The FMS is a screening tool of seven different tests: squat, in-line lunge, hurdle step, shoulder flexibility, hamstring flexibility, core push-up, and rotary stability. Screening of these fundamental movements can help identify deficits in flexibility, quality of movement, core stability, and balance.[61, 62] Even though it has not yet been validated in a military population, it shows promise in the National Football League for predicting injuries.[63, 64] By validation, we mean demonstration that FMS scores predict injury or performance. Several military studies are currently ongoing or in various planning stages.[65]

In addition to the FMS, several validated functional measures were selected. These include the T-test for agility,[66, 67] six meter hop for time,[68, 69] single leg hop for distance,[68-70] Vertec vertical jump,[71] seven site skin fold body fat measures,[66,72-76] MAST balance test,[77] and a locally used test of core strength: the kip-up (feet over the bar, Figure 2).

Figure 2: *Kip-up*

Classes ran year round for six weeks with two to three weeks off between classes for testing. This allows for six iterations per year. A subjective questionnaire and the pre-testing were completed one to two weeks prior to the start of each class. (See Appendix G for the data collection form.) Testing was conducted at the same time of day as the class sessions (roughly 0600 – 0730). Complete testing on one individual took approximately 30 minutes. Participants were instructed to warm-up for five minutes on a stationary bike or elliptical trainer, but no stretching recommendations were made. Post-testing was also conducted at the same time of day with the same instructions. All testing was conducted by the same four physical therapy staff members. Testers and participants were purposely not reminded of the pre-test results at post-test time.

Data Analysis

Descriptive statistics were summarized for subject demographic data. Pre to post differences on FMS and functional tests within subjects was analyzed with separate dependent T-tests. Alpha level for all statistical tests was set at 0.05. Microsoft Excel (Office 2000) and SPSS for Windows (v. 12.0) software were used for statistical analysis.

Results

Pre and post testing results are represented in Tables 1 through 8 (shown at the end of the article). Right leg hop for time and distance data are represented in Tables 3 and 4. Left leg data were similar. Statistically and operationally significant differences were noted in nearly every category tested. FMS scores improved an average of 2.5 points (Table 1). T-test improvement was 0.5 seconds (Table 2). Single

leg hop time improved 10% (Table 3). Hop for distance improved approximately 10% (Table 4). Body fat improvement was statistically significant (Table 5). Kip-ups improved 32% (Table 6). Vertical jump height improvement was statistically significant (Table 7). All subjective fitness category self-evaluations demonstrated statistically significant improvements, except for pain (Table 8).

Discussion

The FMS measures flexibility, core stability, and balance.[61, 62] A mean improvement of three points took participants away from the high risk injury cut line of 14 that Keisel identified in professional football players,[63] and theoretically decreased their risk of injury. In our population, most improvements occurred in the active straight leg raise (hamstring flexibility), shoulder mobility, and deep squat technique. These components were commonly addressed during the FTP.

For the T-test, improvement of 0.5 seconds translates into five feet since participants traversed the 40 yard (120 ft) test in approximately 12 seconds. In a war when inches sometimes separate Soldiers from shrapnel or bullet wounds, we feel this merits operational significance.

Single leg hop for distance improved approximately 13cm or 5in. Sometimes 5 or 6in enables a Soldier to clear an obstacle he is jumping over. This can be the difference between injury and success.

While vertical jump height improved statistically, we were disappointed with the 1.5 cm (1/2 inch) improvement. When we first analyzed this data in late 2007 after one year of the FTP, there was no change in vertical jump height from pre- to post-testing. At that time, we added Olympic and power lifts such as the squat, deadlift, and power clean to the individualized strength programs of many of our participants.[44-46] However, participant compliance with these strength program recommendations was not tracked. After discussing this frustration with several leading strength and conditioning specialists from the National Strength and Conditioning Association, we realize it may be unrealistic to expect large gains in power production (vertical leap) in this population that frequently runs five miles or greater. Performing long runs and extended cardiorespiratory training has been shown to negate the effects of weight training for power production.[78, 79]

Core strength is difficult to measure. The U.S. Army utilizes sit-ups which utilize the hip flexors and abdominals.[80] We think a more comprehensive core strength test is the "kip-up". A kip-up is performed from a standing position by holding onto an overhead bar with hands in line and body parallel to the bar while raising the body and clapping the feet together over the bar (Figure 2). The "kip-up" requires excellent upper body and core strength and mimics movements needed to excel on the obstacle course. We were pleased with the improvement noted with kip-ups even though we did not specifically practice them more than once per week. A 32% improvement in this measure seemed very significant and demonstrative of the core focus of the program.

While percent body fat demonstrated a statistically significant pre to post reduction, we realize that the accuracy of skin fold measures do not warrant any improvement claims given the possibility of +/-3 to 4% reliability errors.[72-74] Additionally, most participants were not actively attempting to decrease percentage of body fat as they were already in a healthy zone.

Along with the anecdotal comments like, "…my back no longer hurts when I wear body armor for eight hours," it was encouraging to see statistical improvement in all subjective measures of physical confidence. The program has grown in popularity and classes fill without a need for advertisement. We believe pain scores did not demonstrate significance due to a narrow effect size with low pain numbers to begin with. Obviously, we do not subject someone with significant complaints of pain to agility drills and box jumps. Patients are treated first in the clinic and they are referred to the program upon reaching the 85-90% recovery point.

Some limitations of this study are the number of participants lost to follow-up. As with any voluntary program, compliance to completion was not 100%. There are a variety of reasons why participants fell out of the program to include job requirements, time of day choice, and lack of interest. Our mean number of classes attended was 10/18 for the group that completed both pre-and post-testing.

Another limitation is lack of a control group. While a conscious effort was made not to review pre-test results, participants and therapists were not actively blinded from the results of six to eight weeks prior. It is possible they could have remembered what they scored previously and that could have affected the post-test. Additionally, the testers were also the trainers for the six-week program and this could have caused some bias during the post testing.

This group of participants represents a mixed sample of patients and healthy individuals training together for six weeks. This could be seen as a limitation of this study. When we grossly compared means from patients and non-patients, the improvements were similar. Therefore, we did not feel it necessary to analyze the data separately.

Conclusion

This manuscript outlines an example of a physical therapy-based functional training program that serves to bridge traditional clinic-based rehabilitation and return to duty. Programs like this one can be beneficial for Soldiers returning to duty and those looking for safe, effective ways to train. Rehabilitative professionals in military settings should consider offering something similar for their active duty servicemembers.

Appendix A

Questionnaire

Name _____ Age _____ Date_____

How confident or satisfied are you with yourself in the following categories?
1=not confident/satisfied, 10= extremely confident/satisfied

Balance	1	2	3	4	5	6	7	8	9	10
Agility	1	2	3	4	5	6	7	8	9	10
Strength	1	2	3	4	5	6	7	8	9	10
Core Strength	1	2	3	4	5	6	7	8	9	10
Mobility/Flexibility	1	2	3	4	5	6	7	8	9	10
Training knowledge	1	2	3	4	5	6	7	8	9	10
Speed	1	2	3	4	5	6	7	8	9	10
Endurance	1	2	3	4	5	6	7	8	9	10

Do you have muscle and/or joint tightness? 1=lots, 10=none

1	2	3	4	5	6	7	8	9	10

If so, where_____

Do you currently have any pain, discomfort, or injuries? YES NO If no, skip to next ?

If yes, rate your pain 0 (no pain), 10 (excruciating pain)

0	1	2	3	4	5	6	7	8	9	10

Where and when does it hurt?

What is your height? _____ Current Weight? _____ What do you think is your ideal weight? _____

What are your goals for this program? (Pre-test only) Weight Loss Build Core Strength

Increase Endurance Increased Foot Speed/Agility Strength Gain/Weight Gain

Other _____

Appendix B

Name: _____

Strength and Conditioning Plan

Monday	Week 1		Week 2		Week 3		Week 4		Week 5		Week 6	
Cardio:												
Intervals												
HR 80-100%												
30 Minutes												
Tuesday	**Week 1**		**Week 2**		**Week 3**		**Week 4**		**Week 5**		**Week 6**	
DB Press 0 degree	1x15		1x15		1x15		1x15		1x15		1x15	
DB Press 30 degree	1x15		1x15		1x15		1x15		1x15		1x15	
DB Press 60 degree	1x15		1x15		1x15		1x15		1x15		1x15	
DB Press Flat	1x15		1x15		1x15		1x15		1x15		1x15	
Glute Ham developer (front/back)	3x15		3x15		3x15		3x15		3x15		3x15	
Rotary Torso Machine	3x15		3x15		3x15		3x15		3x15		3x15	
Pull Ups/Gravitron (wide/normal/parallel)	3x15		3x15		3x15		3x15		3x15		3x15	
Leg Press (high/reg/toe out)	3x15		3x15		3x15		3x15		3x15		3x15	
Calf Raises	3x15		3x15		3x15		3x15		3x15		3x15	
Eccentric HS	3x15		3x15		3x15		3x15		3x15		3x15	
Cardio:												
Long Fat Burn												
HR 65%-75%												
>40 Minutes												
Comments												

Appendix C

Name: _____

LE Strength and Conditioning Plan

Monday	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Cardio: Long						
Fat Burn						
HR 65-75%						
>40 Minutes						
Tuesday	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**
Chest Press	3x15	3x15	3x15	3x15	3x15	3x15
Squat	3x15	3x15	3x15	3x15	3x15	3x15
Hang Clean	3x15	3x15	3x15	3x15	3x15	3x15
Deadlift	3x15	3x15	3x15	3x15	3x15	3x15
Glute Ham developer (front/back)	3x15	3x15	3x15	3x15	3x15	3x15
Rotary Torso Machine	3x15	3x15	3x15	3x15	3x15	3x15
Pull Ups/Gravitron (wide/normal/parallel)	3x15	3x15	3x15	3x15	3x15	3x15
Leg Press (high/reg/toe out)	3x15	3x15	3x15	3x15	3x15	3x15
Calf Raises	3x15	3x15	3x15	3x15	3x15	3x15
Eccentric HS	3x15	3x15	3x15	3x15	3x15	3x15
Cardio: Intervals						
HR 80-100%						
30 Minutes						
STRETCH!!!						
Comments						
	HS = Hamstrings, MB = Medball, KB = Kettlebell					
Wednesday	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**
Cardio: Long Fat Burn						
HR 65-75%						
>40 Minutes						
Thursday	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**
Cardio: Intervals						
HR 80-100%						
30 Minutes						
Friday	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**
3 way crunch on physioball	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Walking lunges	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
HS curl on ball	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Monster walks	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
4 way hip	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Triceps blaster	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Wall Ball	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Single Arm Row in Airplane Position	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Push ups w/med balls	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
KB Swing & Press	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Bosu squat w/MB	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Cardio: Intervals						
HR 80-100%						
30 Minutes						
STRETCH!!!						
Saturday						
Cardio: Long						
Fat Burn						
HR 65%-75%						
>40 Minutes						
Sunday	**Day Off**	**Day Off**	**Day Off**	**Day Off**	**Day Off**	**Day Off**

Appendix D

Week 1

1 Monday (quick feet, agility)	min	2 Wednesday (balance/core)	min	3 Thursday (power, explosiveness)	min
Intro	10				
Dynamic Warm up	15	**Dynamic Warm up**	15	**Dynamic Warm up**	15
Shoulder rotation, neck rotation, trunk rot. Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to calf stretch Knee up/out walking Sumo squat to stand		Shoulder rotation, neck trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to Calf stretch Knee up/out walking Sumo squat to stand		Shoulder rotation, neck, trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to Calf stretch Knee up/out walking Sumo squat to stand	
Quick feet / agility	20	**Core / balance**	10	**Plyometrics**	20
Quick feet clock Quick feet directional Ladder: run through, 2 feet in R first, left first, side shuffle R, L, Hokey Pokey R, L, Icky shuffle, Hops with 90 deg turn, scissors R, L, hop scotch 2,1 Other side: A skip, shuffle R/L, Carioca R/L, back peddle, low shuffle R/L, hi knees, power skip, side skip R/L, heel kicks Dips and pull-ups		Monster walking w/bands Lateral R/L jumps with bands 1 leg up to box soft landings "sticking it," forward and side (5 Reps) Kip-ups		A-skip, Bounding Jump drill with ladder (9 passes): 2 feet straight/R/L, 1 foot straight/R/L Rings (5 passes): 2 feet long jump, 1 feet long jump, 2 feet R/L Hurdles: (4 passes) Straight, tuck, mule kick, squat jump Pull-ups / Dips Pyramid box jumps: pushoffs, alternating push offs, lateral pushoffs, alternating lateral pushoffs, multiple box-to-box jump, depth jumps Plyo pushups	
Medicine Balls	0	**Medicine Balls**	5	**Medicine Balls**	5
		Sitting on physioballs diagonal chops, rotations High Kneeling: overhead, low R, low L, low R, high R, floor		Squat jump and throw	
Keiser machines	0	**Keiser machines**	5	**Keiser machines**	5
		5 way leg lifts		Front squats (3/15reps) [Intermix with crunches]	
Physioball / core	10	**Physioball / core**	20	**Physioball / core**	10
Y, T, W, L 3-way crunch Push-ups feet on ball, hands on ball, pushup + on ball Reverse hypers		3-way crunch Reverse crunch cent/R/L Hamstring curl on ball Front Plank (floor elbows and toes) push-up +, alt. leg lifts Side Planks (30 sec hold, reps) Bridging with alt leg lifts		Y, T, W, L 3-way crunch Knee Tucks →progress single leg Bridge with med ball toss to chest Push-up + (If time permits)	

Cool down / recovery 20	**Cool down / recovery 20**	**Cool down / recovery 20**
Foam roller: hamstrings, glutes, IT band, quad, t-spine Quad / hip flexor stretch prone with rope and bolster Hamstring stretch supine with band Prone press-ups Shoulder "sleeper" stretch (sidelying) Gastroc / Soleus stretch against wall Pec stretch at 90 deg and 120 deg	Foam roller: hamstrings, glutes, IT band, quad, t-spine Quad / hip flexor stretch prone with rope and bolster Hamstring stretch supine with band Prone press-ups Shoulder "sleeper" stretch (sidelying) Gastroc / Soleus stretch against wall Pec stretch at 90 deg and 120 deg	Foam roller: hamstrings, glutes, IT band, quad, t-spine Quad / hip flexor stretch prone with rope and bolster Hamstring stretch supine with band Prone press-ups Shoulder "sleeper" stretch (sidelying) Gastroc / Soleus stretch against wall Pec stretch at 90 deg and 120 deg

Appendix E

Week 3

1 Monday (quick feet, agility) min	**2 Wednesday (balance/core) min**	**3 Thursday (power, explosiveness) min**
Dynamic Warm up 15	**Dynamic Warm up 15**	**Dynamic Warm up 15**
Shoulder rotation, neck rotation, trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to Calf stretch Knee up/out walking Sumo squat to stand	Shoulder rotation, neck trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to Calf stretch Knee up/out walking Sumo squat to stand	Shoulder rotation, neck, trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to Calf stretch Knee up/out walking Sumo squat to stand
Quick feet / agility 30	**Core / balance 30**	**Plyometrics 15**
Quick feet clock Quick feet directional Outside Circuit: ladder, cones, discs, hurdles	Circuit: 1. Kip up 2. Airplane single arm row 3. Bosu ball squat press 4. Ab wheel 5. Lunge walk/rotate 6. Single leg balance with ball toss against wall 7. Medicine ball walking push ups 8. Triceps blaster on physioball 9. Seated RC external rotation 10. Split squat on ball	Jump drill with ladder(9 passes): 2 feet straight/R/L, 1 foot straight/R/L Rings (5 passes): 2 feet long jump, 1 feet long jump, 2 feet R/L Hurdles: (4 passes) Straight, tuck, mule kick, squat jump Pull-ups / Dips Pyramid box jumps: pushoffs, alternating push offs, lateral pushoffs, alternating lateral pushoffs, multiple box-to-box jump, depth jumps Plyo push-up
Medicine Balls 0	**Medicine Balls 0**	**Medicine Balls 5**
		Squat jump and throw

Keiser machines	**0**	**Keiser machines**	**0**	**Triplet**	**15**
				15 push-ups 15 body weight squats 30 jumps on jump rope Repeat 10 times	
Physioball / core	**15**	**Physioball / core**	**15**	**Physioball / core**	**10**
Y, T, W, L 3-way crunch Push-ups feet on ball, hands on ball, pushup + on ball Reverse hypers		Plank on ball or floor (1 set push-up +, knee tucks, single leg push-ups) combine with side plank (1 set hold, 1 set leg up) Russian twist Crunches straight/diagonal/reverse V-up with ball pass Hamstring curl		Y, T, W, L 3-way crunch Bridge with med ball toss to chest Bridging - with chest pass Kneel on ball Push-up + (If time permits)	
Cool down / recovery	**15**	**Cool down / recovery**	**15**	**Cool down / recovery**	**15**
Foam roller: hamstrings, glutes, IT band, quad, t-spine Quad / hip flexor stretch prone with rope and bolster Hamstring stretch supine with band Prone press-ups Shoulder "sleeper" stretch (sidelying) Gastroc / Soleus stretch against wall Pec stretch at 90 deg and 120 deg		Foam roller: hamstrings, glutes, IT band, quad, t-spine Quad / hip flexor stretch prone with rope and bolster Hamstring stretch supine with band Prone press-ups Shoulder "sleeper" stretch (sidelying) Gastroc / Soleus stretch against wall Pec stretch at 90 deg and 120 deg		Foam roller: hamstrings, glutes, IT band, quad, t-spine Quad / hip flexor stretch prone with rope and bolster Hamstring stretch supine with band Prone press-ups Shoulder "sleeper" stretch (sidelying) Gastroc / Soleus stretch against wall Pec stretch at 90 deg and 120 deg	

Appendix F

Week 6

1 Monday (quick feet, agility)	**min**	**2 Wednesday (balance/core)**	**min**	**3 Thursday (power, explosiveness)**	**min**
Dynamic Warm up	**15**	**Dynamic Warm up**	**15**	**Dynamic Warm up**	**15**
Shoulder rotation, neck rotation, trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to calf stretch Knee up/out walking Sumo squat to stand		Shoulder rotation, neck trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to calf stretch Knee up/out walking Sumo squat to stand		Shoulder rotation, neck, trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to calf stretch Knee up/out walking Sumo squat to stand	

Quick feet / agility 30

Quick feet clock
Quick feet directional
Outside circuit with weighted vests

Core circuit 30

1. Bosu ball squat press
2. Kip ups
3. Airplane single arm row on airex pad
4. Ab wheel
5. Slide board lunges
6. Single leg balance med ball toss
7. PNF med ball diagonals
8. Keiser diagonal pulley pulls up
9. Keiser diagonal pulley pulls down
10. Keiser punch
11. Med ball rotation back to wall

Prison yard workout: 45

Jog there and back approx 400 meters each way
400 meter run (pacer) with other stations below:
Sled pull 100 meters with 100# fwd and backward with scapular retraction
Heavy ball carry (50-100 lbs x 50 meters)
Plyometric box jumps
Pull-ups / push-ups to muscle failure
Dips / supine ring pull-ups to muscle failure
Kettle bell swings 20 each side
Tire flips x 50 meters (200-400# tires)

Medicine Balls 0

Keiser machines 0

Physioball / core 15

Y, T, W, L
3-way crunch
Push-ups feet on ball, hands on ball, pushup + on ball
Reverse hypers
V ups

Cool down / recovery 15

Foam roller: hamstrings, glutes, IT band, quad, t-spine
Quad / hip flexor stretch prone with rope and bolster
Hamstring stretch supine with band
Prone press-ups
Shoulder "sleeper" stretch (sidelying)
Gastroc / Soleus stretch against wall
Pec stretch at 90 deg and 120 deg

Medicine Balls 0

Keiser machines 0

100/200/300 workout 15

100 pull-ups
200 push-ups
300 crunches
In 10 sets of 10/20/30 for time

Cool down / recovery 15

Foam roller: hamstrings, glutes, IT band, quad, t-spine
Quad / hip flexor stretch prone with rope and bolster
Hamstring stretch supine with band
Prone press-ups
Shoulder "sleeper" stretch (sidelying)
Gastroc / Soleus stretch against wall
Pec stretch at 90 deg and 120 deg

Medicine Balls 0

Keiser machines 0

Physioball / core 0

Cool down / recovery 15

Foam roller: hamstrings, glutes, IT band, quad, t-spine
Quad / hip flexor stretch prone with rope and bolster
Hamstring stretch supine with band
Prone press-ups
Shoulder "sleeper" stretch (sidelying)
Gastroc / Soleus stretch against wall
Pec stretch at 90 deg and 120 deg

Appendix G

Data Collection Form

Name, # _____ Age _____ Date_____

Is this test: Pre-test Post-test General evaluation

Dominant Hand: right or left (circle) Dominant foot: right or left

———————————-To be completed by physical therapist————————————————————-

Functional Movement Screen (from reverse) _____

T-test _____ sec

Single leg hop for time R _____ sec

Single leg hop for time L _____ sec

Single leg hop for distance R _____ cm

Single leg hop for distance L _____ cm

Kip-ups _____

Vertical Leap _____in x 2.54 = _____cm

MAST
R _____ = _____
L _____ = _____

Skin fold:
Chest _____
Abdominal _____
Iliac _____
Mid-axillary _____
Triceps_____
Scapular_____
Thigh _____
Sum _____
% BF _____

Appendix G (continued)

Functional Movement Screen

Test	Raw Score	Final Score	Comments
Deep Squat			
Hurdle Step L			
Hurdle Step R			
In Line Lunge L			
In Line Lunge R			
Shoulder Mobility L			
Shoulder Mobility R			
Active Straight Leg Raise L			
Active Straight Leg Raise R			
Trunk Stability Push Up			
Rotary Stability L			
Rotary Stability R			
Total			
Active Impingement Right			
Active Impingement Left			
Extension			
Flexion			

Table 1

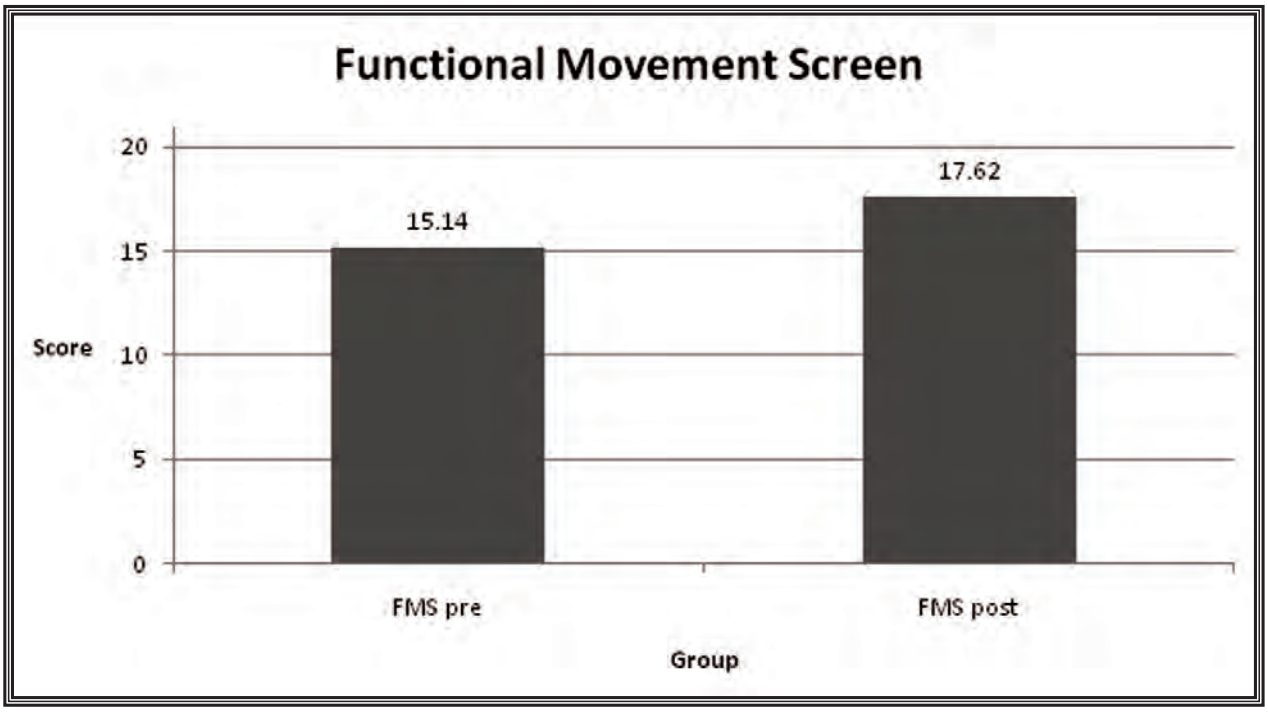
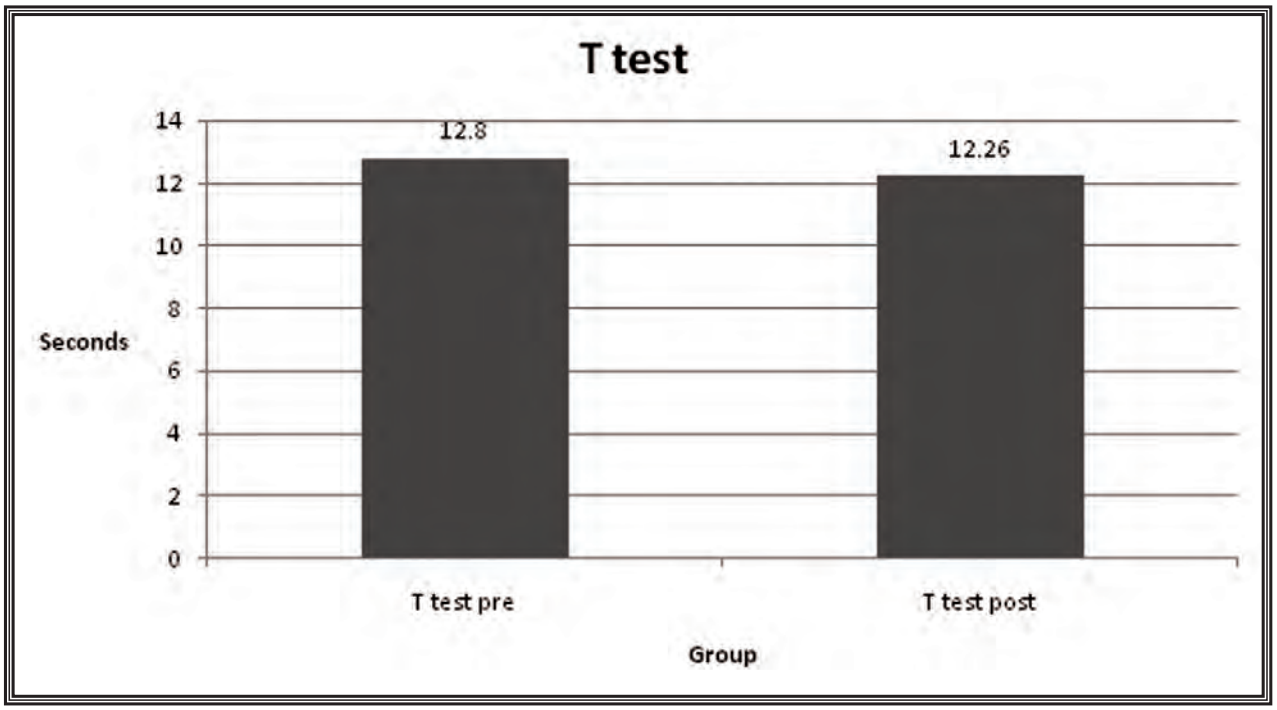


Table 2



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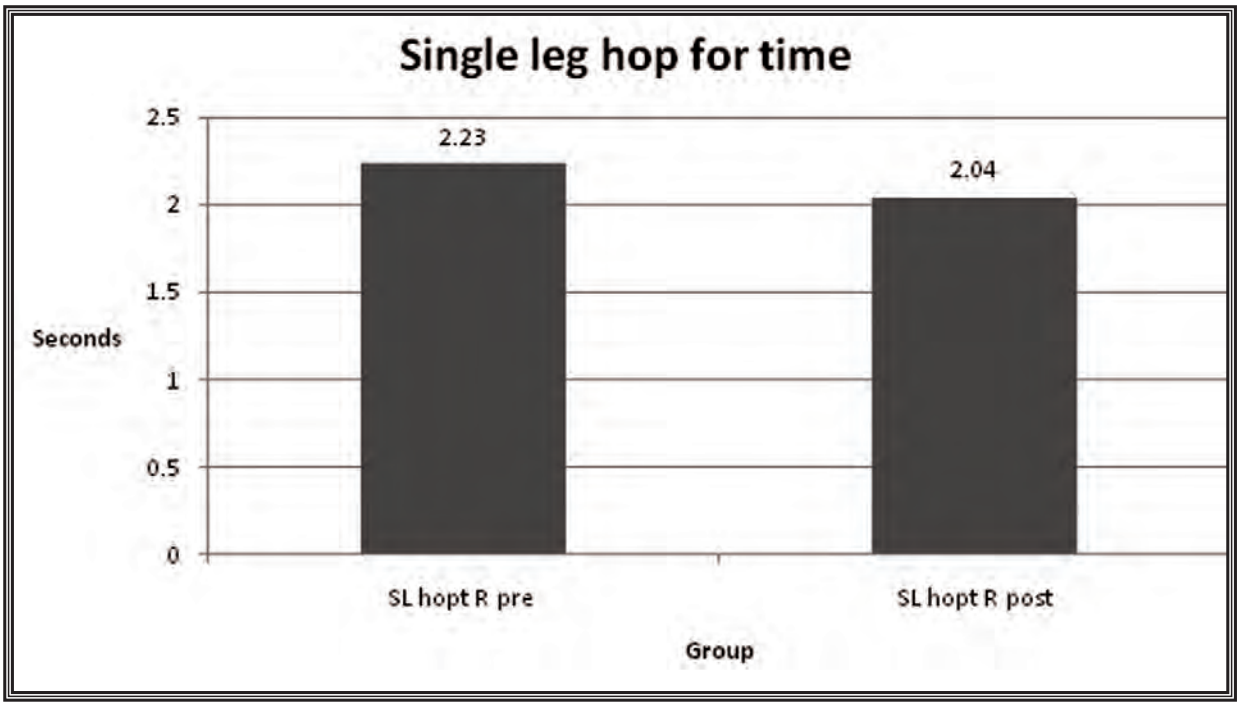

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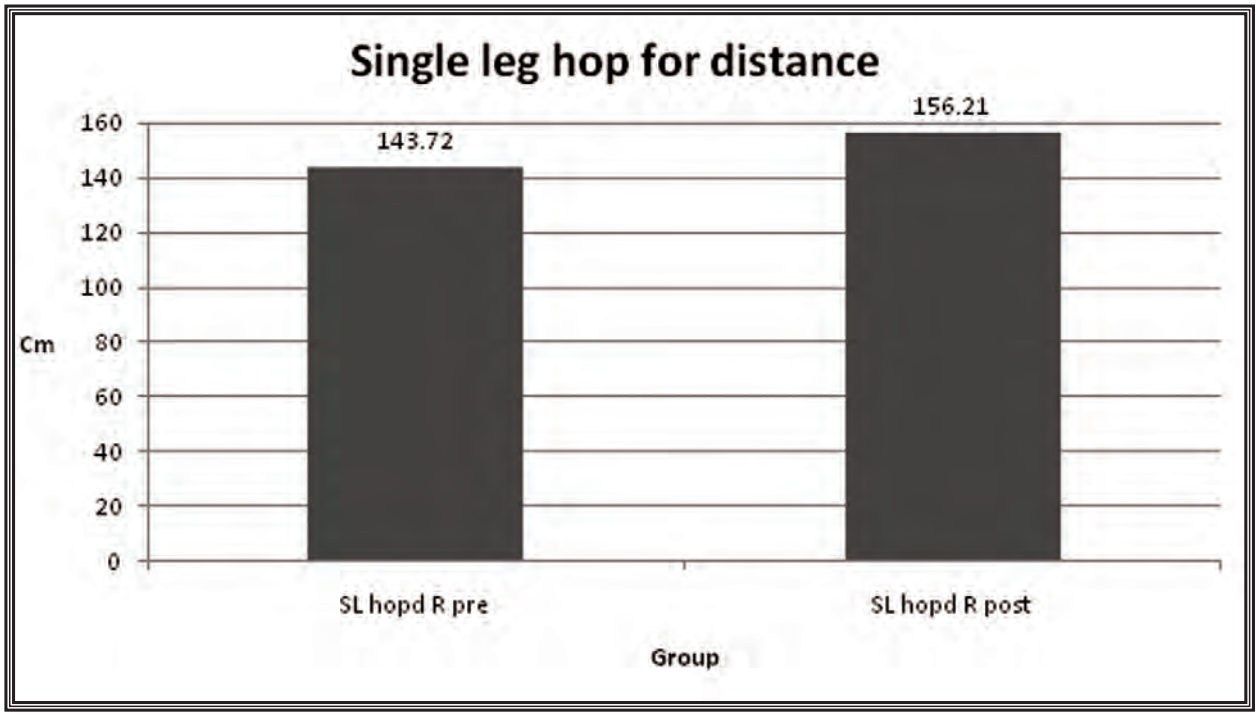

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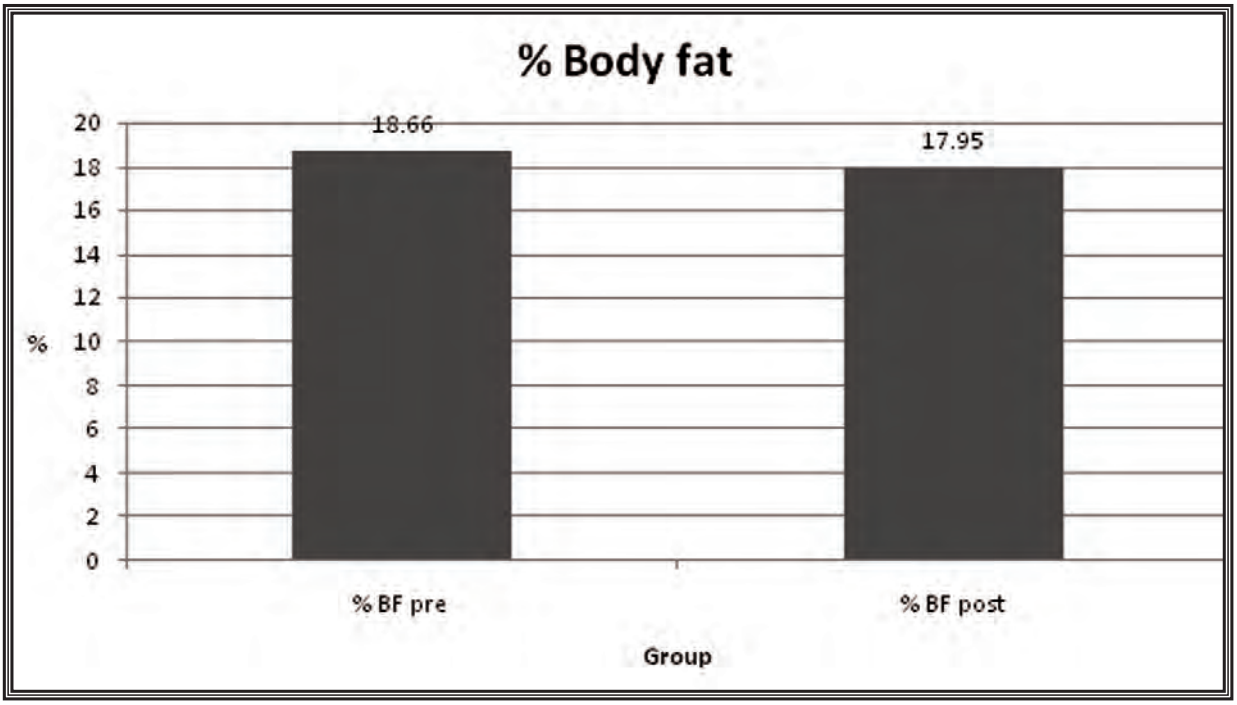

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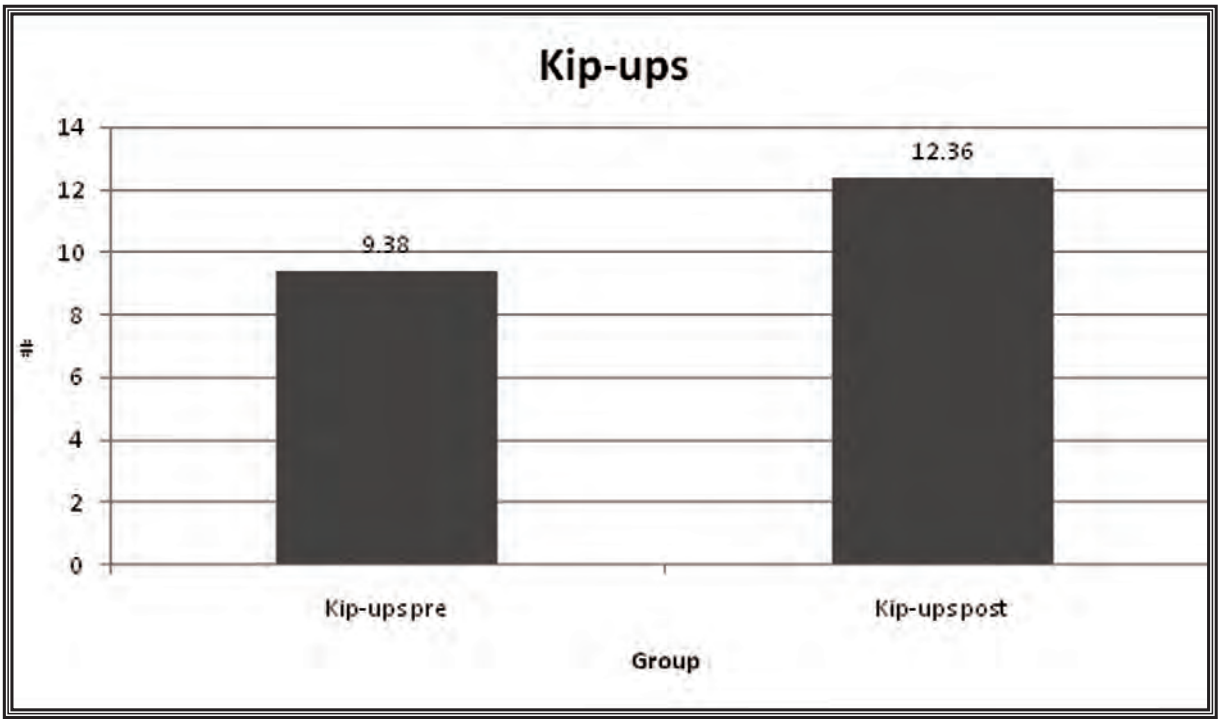

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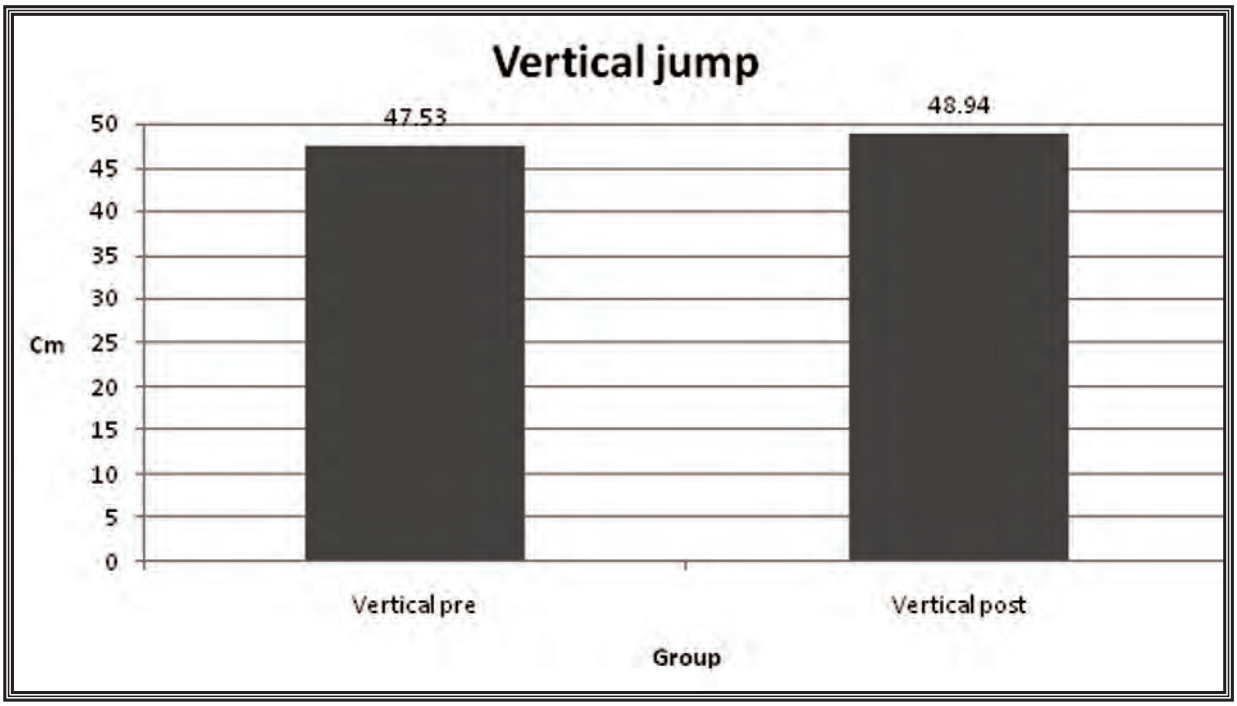

Table 8

	Pre	Post	Diff
Balance	6.0	7.1	1.1*
Agility	6.0	6.9	0.9*
Strength	6.3	7	0.7*
Core Strength	5.7	7.0	1.3*
Mobility/Flexibility	4.9	6.4	1.5*
Training knowledge	6.2	7.1	0.9*
Speed	5.3	6.7	1.4*
Endurance	5.6	6.8	1.2*
Tightness (higher number better)	5.4	6.4	1.0*
Pain	1.9	1.5	-0.4**

*p<0.05
**p>0.05

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The Impedance Threshold Device (ITD-7) A New Device for Combat Casualty Care to Augment Circulation and Blood Pressure in Hypotensive Spontaneously Breathing Warfighters

Don Parsons, PA-C; Vic Convertino PhD; Ahamed Idris, MD; Stephen Smith, MD; David Lindstrom, MD; Brent Parquette, Medic; Tom Aufderheide, MD

Disclosure: None of the authors work for or have any financial interest or investment with the manufacturer of the impedance threshold device (ITD-7).

Abstract

Inspiration through -7cm H2O resistance results in an increase in venous blood flow back to the heart and a subsequent increase in cardiac output and blood pressure in hypotensive animals and patients. Breathing through the impedance threshold device with 7cm H2O resistance (ITD-7) also reduces intracranial pressure with each inspiration, thereby providing greater blood flow to the brain. A new device called an ITD-7 was developed to exploit these physiological mechanisms to *buy time* in hypotensive War Fighters when other therapies are not readily available. Animal and clinical data with the ITD-7 demonstrate the potential value and limitations of this new non-invasive approach to enhancing circulation.

ITD-7 with Facemask

ITD-7 Mouthpiece

Figure 1: *ITD-7 used with facemask (head strap and O2 attached) or mouthpiece.*

Introduction

This primer highlights an important new device, the impedance threshold device (ITD-7) (Figure 1), that can enhance circulation to the heart and brain in the care of spontaneously-breathing hypotensive Soldiers. The ITD-7 has been shown in animal and human studies to be useful as a new way to buy time between the onset of injury and when more definitive therapy is available. A better understanding of this device, which is based upon the fundamental mechanisms that regulate blood pressure during hemorrhage and hypotension, will help optimize care in warfighters wounded in battle. This simple non-invasive countermeasure helps protect against life-

threatening hypotension by restoring central blood volume through enhancement of venous blood flow back to the heart with each inspiratory effort.

How it works

The Physiology

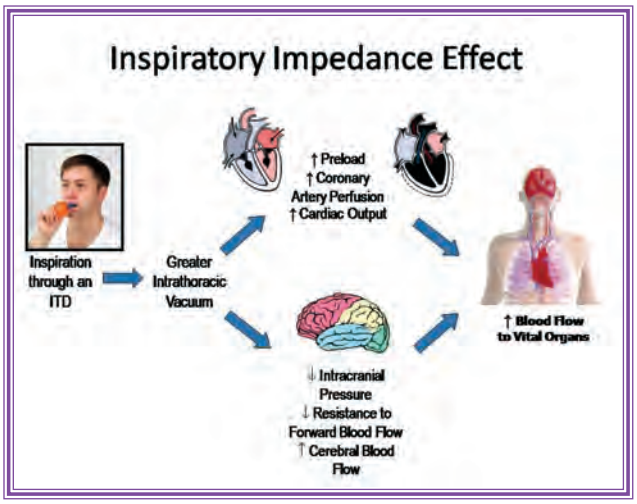

Figure 2: *How the IDT-7 works, shown attached to a mouthpiece.*

Significant blood loss leads to severe hypotension in the wounded warfighter because of reduction in cardiac filling and stroke volume. Increased negative intrathoracic pressure during spontaneous inspiration is a natural mechanism for enhancing venous return and cardiac refilling. (Figure 2) The ITD-7 is designed to non-invasively harness that natural physiology to increase venous return and stroke volume, serving as an effective countermeasure against cardiovascular collapse. Taking advantage of this natural physiology, application of this new device during spontaneous inspiration causes an immediate increase in arterial blood pressure in the setting of severe hypotension. The 7cm H2O inspiratory resistance induced by the ITD-7 results in a greater vacuum within the thorax during each inspiration and subsequently enhances refilling of the heart and also lowers intracranial pressure. These two mechanisms (refilling of the heart and lowering of intracranial pressure) contribute to the increase in blood flow to the heart and brain when using the device. Application of the device can therefore be used to rapidly increase blood pressure in hypotensive spontaneously breathing Soldiers when more definitive therapy is not yet available. It has some additional advantages as it does not cause hemodilution and, unlike many other types of resuscitative measures, it can be immediately removed following hemodynamic stabilization.

Device Testing

The ITD-7 was tested in animal models of hemorrhagic shock and heat stroke, in human volunteers, and in hypotensive patients in the emergency department and in dialysis clinics.[1-11] In pigs in hemorrhagic shock, the ITD increased systolic and diastolic blood pressure, enhanced blood flow to the heart and brain, and extended the *golden hour* of survival.[6,7,10] (Figure 3) In volunteers

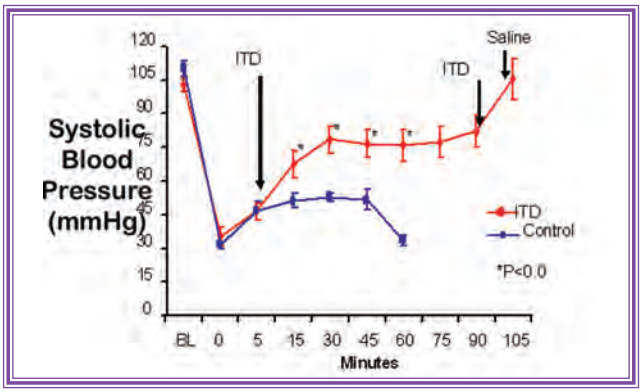

Figure 3: *Benefit of an impedance threshold device (ITD) on blood pressure in pigs with hemorrhagic shock*

tested at NASA , an ITD with a resistance of 7cm H2O was well tolerated. It also increased cardiac output in normal subjects by 1.5L/min, and prevented symptoms associated with acute orthostatic hypotension.[1,2,4] The ITD has an inspiratory resistance of 7cm H2O and no expiratory resistance. In volunteers tested at the U.S. Army Institute for Surgical Research, a prototypic ITD was shown to increase blood flow to the brain and significantly delay the onset of hypotension in volunteers subjected to severe hypotension induced by lower body negative pressure to simulate hemorrhagic shock.[1,3,9]

In hypotensive patients the ITD-7 increased systolic blood pressures and was well tolerated.[2,5,8,11] In the absence of an IV, hypotensive patients treated with the ITD-7 by medics outside the hospital or by medical per-

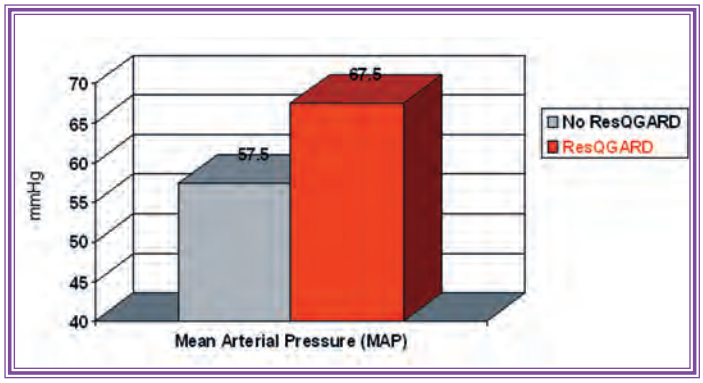

Figure 4: *IDT-7 (ResQGARD) increases mean arterial pressure (MAP) in hypotensive patients*

sonnel in the emergency department benefited immediately. With ITD-7 application there was a rise in mean arterial pressure by ~10mmHg within 5 to 10 minutes.[5,11] (Figure 4) These patients did not receive concurrent fluid therapy as no IV line could be placed. When fluid resuscitation therapy was given concurrently, systolic blood pressures rose even faster by nearly 20mmHg within 10 minutes. (Figure 5) The work of breathing associated with the ITD-7 was measured and it was not significantly greater than the amount of work needed to breathe naturally at rest.[4] Due to the relatively small increase in work needed to breathe through the ITD-7, it was generally well tolerated for at least 30 to 60 minutes.

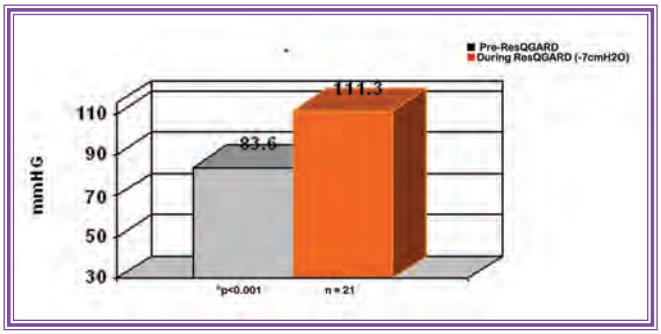

Figure 5: *IDT-7 (ResQGARD) increases systolic blood pressure in hypotensive patients treated by paramedics outside the hospital*

How to use it

The ITD-7 is simple to apply and can be used with either a mouth piece or a face mask as shown in Figure 1. When used with a facemask, it can be held in place by an optional head strap. After inserting the ITD-7 into the mouth or applying the facemask and ITD-7, instruct the hypotensive Soldier to breath in through the device as they normally would, at a rate of ~12 times/minute. The user will feel the slight resistance with each inspiration, which is helping to increase blood return to the heart and increase blood pressure. Oxygen can be applied at up to 6L/min to the small nipple attached to the ITD-7. The ITD-7 can be used on Soldiers getting other therapies. A resuscitator bag can be attached to the ITD-7 if needed to provide assisted ventilations. Remove the ITD-7 if it causes respiratory distress, or after the blood pressure has been restored. The device can be used for 30 to 60 minutes. Longer application can be performed as long as the Soldier does not complain of difficulty breathing.

When to use it

Indications

The ITD-7 should be used in spontaneously breathing symptomatic Soldiers who are hypotensive (systolic blood pressure <110mmHg), feel faint, or feel lightheaded. The ITD-7 can be used to treat multiple causes of low blood pressure as described in Table 1.

Table 1: Causes of Hypotension Treatable with the ITD-7

Blood loss
Heat stroke
Dehydration
Severe orthostatic hypotension
Other potentially reversible causes of low blood pressure and low blood flow – including early stages of sepsis

If there is ongoing uncontrolled bleeding, stop the bleeding before applying the device. The ITD-7 should not be used in Soldiers with an open chest wound or unconscious Soldiers unless they are intubated, still breathing, and hypotensive. The ITD-7 can be used when lying, sitting, standing, or walking. The ITD-7 may be particularly helpful in the setting of severe limb injuries after a tourniquet has been applied.

Table 2: Contraindications to ITD-7 Application

Uncontrolled bleeding
An open chest wound
Lack of spontaneous respiration
Agonal breathing at rates of < 8 breaths/min
Complaints of difficulty breathing
Congestive heart failure, when causing hypotension

Summary

The ITD-7 can be used to treat symptomatic hypotensive Soldiers who are breathing spontaneously. It is FDA-approved as a circulatory enhancer for the treatment of relative hypovolemia and hypotension suffered by people as a result of reduced central blood volume. It is lightweight, easy to use, durable, and well tolerated. It can be used to buy time by providing a critical bridge to more definitive repair of the primary injury.

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Medical History

The United States Army Special Forces — Walter Reed Army Institute of Research Field Epidemiologic Survey Team (Airborne)

Louis Theodore Dorogi, LTC, MSC (USAR Ret)

Abstract

The U.S. Army Special Forces — Walter Reed Army Institute of Research Field Epidemiological Survey Team (Airborne) was formed in late 1965 and later deployed to Vietnam in 1966. Funded by Walter Reed Army Institute of Research and staffed by highly trained Special Forces qualified medical personnel from Fort Bragg, North Carolina, the team was attached to the 5th Special Forces Group (Airborne) while in Vietnam. During its short existence, the team conducted extensive and important field studies on diseases of military medical importance, often under combat conditions.

Early Medical Research Planning

The military situation in South Vietnam during the latter half of 1961 foreshadowed increasing United States involvement. Experience in World War II and Korea had shown that the military medical problems encountered in the Pacific and Southeast Asia demanded immediate attention. On January 3, 1962, the Chief, Research and Development, Department of the Army, requested the Surgeon General's proposals for establishment of an appropriate medical research and service program, focusing on military medical problems that United States troops could expect, if called upon to serve in South Vietnam.[1] The Surgeon General's reply, submitted within the next two weeks, called for a comprehensive program. The increase in service requirements was tied to the decisions on future buildup of U.S. forces, and specifically, the Surgeon General called for the establishment of necessary patient care, medical evacuation and preventive medicine units with professional augmentation, plus a medical research laboratory. These elements of the medical research and service program were to be identified as a distinct unit acting in close liaison with South Vietnam's military medical and civilian medical community. The Surgeon General cited the need for close coordination with existing U.S. assets already in-country and an awareness of the concepts concerning employment of U.S. forces in para-military organizations.[2] Program supervision was to begin with the Commander in Chief, Pacific (CINCPAC), Military Assistance Advisory Group Vietnam (MAAGV), with operational control to be exercised by the Command Surgeon of the overall medical assets in Vietnam. Approval of the concept plan was to be followed by a more detailed analysis, citing specific resource requirements.[3]

Interim revisions of the plan called for activation of an Army medical research unit. Pending establishment of the unit, temporary field teams of researchers were to be sent in order to begin studying the ecology and control of disease vectors and isolation of rickettsial and viral agents in Vietnam. The research unit was to be considered a field unit of Walter Reed Army Institute of Research with attachment for logistics and administration to the newly established 8th Field Hospital at Nha Trang.

To support the planned research effort, an increase of 25 additional beds to the existing 100 bed capacity of

the hospital was proposed. Staffing was to consist of research personnel.[4] This research unit was to serve as a base of operations for additional field teams coming from other highly sophisticated research facilities located offshore.

Established medical evacuation patterns from Vietnam and existing offshore military facilities in the Pacific suggested utilization of Okinawa as the initial backup support site for conducting medical research. Clark Air Force Base in the Philippines was viewed as a possible long range, central offshore support site for field elements in Southeast Asia. It was felt that for certain clinical studies, there were advantages in evacuating selected patients to a sophisticated research support base, instead of "…transporting complex laboratory equipment and refrigeration capability into jungle areas."[5] Proposed problems for medical investigation focused on preventive medicine, combat surgery and medicine, neuropsychiatry, and field testing of medical equipment.

By 22 May 1962, the Director of Defense Research and Engineering approved the concept plan in principle for planning purposes. He specifically endorsed immediate activation in Vietnam of a medical research unit from Walter Reed Army Institute of Research. Subsequent coordination with CINCPAC through the Joint Chiefs of Staff resulted in support of the plan, eliminating the need for a central research facility in the Philippines, in favor of existing Pacific medical research facilities.[6]

COL (later BG) William D. Tiggert, Medical Corps, headed the fact-finding team which departed for Southeast Asia to conduct a six month study of medical research facilities and resources. In January 1963, the team filed its report. COL Tiggert recommended a realignment of medical research efforts in Southeast Asia, establishment of a medical research unit in Vietnam administered directly by the Walter Reed Army Institute of Research (WRAIR) and reorientation of existing medical research facilities in Kuala Lumpur and Bangkok to support future medical research efforts in Vietnam. Offshore medical research facilities in Japan and Taiwan were recognized as probable support sites.[7] The fledgling Seventh Medical Laboratory (Detachment #1) in Saigon was viewed as a likely pivot for expanding research.[8]

Further proposals by COL Tiggert, et al., focused on the need for priority research in areas of wounding patterns and the required surgery, drug resistant malaria, and a study of medical advisory effectiveness in limited war. A need for further clinical and laboratory studies in selected infectious and parasitic diseases was also cited.[9] Requirements for supportive personnel, funding, and administration were emphasized, recognizing that "…a large proportion of the proposed program deals with subjects in which a theater medical laboratory does not have competence…" and that "…direction of the effort must come from an organization such as WRAIR, capable of operating anywhere in the world."[10]

With the subsequent approval by the Director of Defense Research and Engineering in August 1963, the U.S. Army Medical Research Team (Walter Reed Army Institute of Research) Vietnam (hereafter MRT) was activated and established in Saigon by November of that year. Its chain of command was to be through the Director of WRAIR to the Commanding General, Medical Research and Development Command.[11]

Initially located at facilities provided by the U.S. Army Support Group, MRT moved in July of 1964 to a site directly across from the Institute Pasteur, Vietnam's primary medical research facility. This auspicious proximity to the Institute resulted in excellent collaboration, establishment of a plague research laboratory equipped by MRT and built by the Institute, and publishing of a joint annual progress report.[12]

The FEST Emerges

Concurrent with the establishment of the MRT in Saigon, the U.S. Army Center for Special Warfare (CSW) at Fort Bragg initiated modest efforts to identify tropical diseases that Special Forces personnel were exposed to during their brief Pacific area tours. For periods up to six months, Special Forces were routinely assigned to Southeast Asia on temporary duty, either from Okinawa or Fort Bragg.

The genesis for these efforts was found in the continuing need for up-to-date medical data and intelligence. The newly assigned CSW Surgeon, LTC (later COL) Richard L. Coppedge, Medical Corps, was instrumental in formulating a suitable program for production of this vital information. He proposed a plan in September of 1962 which envisioned utilization of the talents of Special Forces aidmen, to act as "sentinels" for collection of medical information from remote overseas areas. This was to be accomplished in accordance with guidelines approved by senior specialists in appropriate fields of medicine and allied sciences.[13] Incorporated subsequently into this plan was a residency training project developed by a young preventive medicine resident at Womack Army Hospital. MAJ (later COL) Llewellyn J. Legters, Medical Corps, designed a medical screening program for Special Forces personnel returning from Vietnam. In July 1963, he was transferred to the CSW as the Preventive Medicine Officer and gained the opportunity to test his program.[14]

With extensive field medical experience in airborne units, a Master's Degree in Public Health from Harvard, and a prodigious capacity for work, MAJ Legters was well suited for this assignment. His screening program pivoted

on identification of personnel to be deployed overseas, followed by a pre-mission physical, with accompanying laboratory examination of blood and stool samples. Upon return from overseas, a post-mission physical was to be performed on these same individuals, with resulting laboratory studies utilized for comparison. Individually drawn sera obtained prior to deployment were compared to post-mission sera. Through extensive antibody titration processes, exposure to diseases encountered overseas was determined. In addition to sera comparisons, extensive laboratory studies were made.[15]

Initiation of this program quickly produced positive results, alerting the CSW Surgeon's Office to numerous problems that faced Special Forces personnel in Vietnam. Identification of specific diseases and follow-up studies by the CSW Surgeon's Office led to an increasingly close, but still informal relationship with Walter Reed Army Institute of Research through a few joint studies.[16] Through briefings to the Armed Forces Epidemiological Board by CSW medical personnel, data generated from post-mission medical screenings came to the attention of other military medical researchers.[17]

Identification of chloroquine resistant *Plasmodium falciparum* malaria in a Special Forces Soldier hospitalized at Fort Bragg focused on the CSW screening program. Findings created an awareness of the potential for large scale medical problems, if increased numbers of U.S. troops were introduced into Southeast Asia. A need for further study was indicated.[18]

As more epidemiological data became available from increasing numbers of returnees, MAJ Legters soon realized that a vital facet of the military medical research cycle was missing. Traditional medical research focused on hospitalized patients, not the circumstances for disease transmission. Environmental and epidemiological data was needed to complete the picture on diseases of military significance and to identify any possibilities for disease prevention and reduction. His worries encompassed not only the short-range acute diseases readily identified, but also those medical problems such as tuberculosis, where a latency period had to be considered. There was no doubt in his mind about the laboratory capability available in the Army's stateside resources. Essential "field" capability was missing.[19]

To fill this gap, MAJ Legters envisioned a field collection unit, with a mission of studying diseases of military significance. The unit was to be composed of Special Forces medical personnel, supported by a sophisticated laboratory facility and adequate funding. Neither of the last two resources was available at the CSW. The concept certainly had merit, since the deployment of Special Forces units to Vietnam led to the establishment of numerous A-camps throughout Vietnam. The opportunity to utilize Special Forces assets now existed.

Seeking support from Medical Research and Development representatives for such a project, MAJ Legters was not given much encouragement until he visited WRAIR. As he tells it "…I think I had a fairly good concept in my own mind. I am not sure how well I articulated it, but after several attempts at the headquarters level, without much success, I remember going out to the Walter Reed Army Institute of Research one day. … Somehow, I can't remember the details; I wound up in COL Tiggert's office explaining the concept. Much to my amazement, COL Tiggert said 'I will support the project.'"[20]

With the backing of the Director of WRAIR, MAJ Legters received impetus to formalize the organization, funding and training of the unit that was to be known shortly by possibly one of the longest titles within the Army force structure, specifically the United States Army Special Forces — Walter Reed Army Institute of Research Field Epidemiological Survey Team (Airborne) {hereafter referred to as FEST}.

Organization and Personnel

The 3rd, 6th, and 7th Special Forces Groups and Training Group provided most of the volunteers for the initial contingent of FEST in the fall of 1965. A local arrangement at the CSW released these personnel for special duty with the Office of the Surgeon, CSW, pending receipt of the final space authorizations for FEST. Volunteers were recruited against a proposed personnel authorization which coincided with the initial table of distribution (TD) for the FEST, subsequently approved on 15 May 1966. The TD reflected a personnel space authorization of 26 and was functionally divided into three separate sections. All positions called for Special Forces qualifications and training, in addition to the specific medical skills. A headquarters section of eight personnel supported five clinical teams, plus a field survey section.[21]

Each clinical section, composed of a physician and a laboratory technician (MOS 92B4S), was assigned a specific research project. Because of Special Forces-wide shortage of qualified laboratory technicians, only four of the initial five 92B4S positions were filled, mostly from instructor cadre of the Advanced Medical Training Committee of the Special Forces Training Group. For the sake of expediency, a skilled Special Forces aidman without full laboratory training was assigned to the last position. The field survey section, headed by an entomologist, was more fortunate in assignment of a full complement of trained personnel.

The broad mission of FEST in Southeast Asia was to be three-fold: (1) to collect remote area epidemiologic

intelligence, (2) to conduct field studies of significant military medical diseases, and (3) to conduct field trials of appropriate prophylactic measures, both preventive and pharmacological, for those diseases.[22] It was organized primarily to provide a highly mobile capability for medical research operations, based on small cellular sections as the primary investigative elements, focusing on specific diseases or vector studies. The headquarters element was to provide necessary administrative and logistic support, while controlling the overall direction of research. This cellular arrangement was designed for flexibility and rapid response capability to in-country targets of opportunity, while concentrating mainly on predetermined medical problems.

Receipt of the space allocations precipitated a reassignment of all personnel who were on special duty with the CSW Surgeon's Office. Orders read "…assignment to Walter Reed Army Institute of Research …" with attachment for administration, rations, and quarters to the 7th Special Forces Group (Airborne) at Fort Bragg. All positions remained as Special Forces positions on parachute status. The Team's duty station also remained Fort Bragg, until deployment to Southeast Asia.[23] Legters anticipated a need for future replacements, well in advance of deployment; however, his team had to prove itself before solid support was to be gained for replacements. This requirement was critical due to the lengthy pre-deployment training period, in addition to the need for completion of airborne and Special Forces training that preceded it. After the departure of the FEST to Vietnam, a liaison officer, CPT (later MAJ) George E. Hoxsey, MSC, ably carried out the task at Fort Bragg of identifying and selecting volunteer replacements, though no formal authorization yet existed for them on WRAIR's TD.

Late in December 1966, necessary formal measures were taken to ensure adequate replacements for the initial contingent of FEST personnel serving the standard 12-month tour in Vietnam. WRAIR made fourteen spaces available from its TD, to be converted to "Special Forces qualified" medical slots, allowing long range control for selection and training of replacements. The augmentation was also significant, adding veterinary and laboratory officers.[24]

Training of FEST Personnel

With the selection of FEST personnel, a vigorous fifteen week pre-deployment training program was initiated at Fort Bragg. Through funds provided by WRAIR, the FEST was trained in the laboratory and field epidemiologic skills suitable for studying a wide variety of diseases. The three-phase program, totaling 684 hours, included a variety of specially selected medical subjects, Vietnamese language training, and mandatory military subjects.

Beginning 29 November 1965, the initial training got under way with the drafting of formal medical research protocols and identification of related supplies and equipment. Budgetary, administrative, operational, and supply requirements were developed.[25] Representatives of the G-3 of the Center for Special Warfare taught mandatory military subjects.

A medical lecture series featured a number of noted scientists such as Dr. Philip Manson-Bahr of Tulane University, Dr. Alexander D. Langmuir of the National Communicable Disease Center (CDC), and Drs. Robin D. Powell and Paul E. Carson of the University of Michigan. They brought their wisdom and experience to the Center for Special Warfare. Each speaker covered some topic which related to significant military medical problems that the FEST might be called on to survey in Southeast Asia.[26]

Figure 1: *FEST members on parachute training exercise during April 1966. (Author's photo)*
(From L to R—LTC Legters, MSG Hickman, CPT Colwell, SSG Hajduk, CPT Boone, CPT Dorogi, SP4 Smith)

The Team underwent further laboratory training at WRAIR, CDC, and Fort Bragg. Practical field exercises were conducted at on and off post sites. It is curious to note that during one such exercise (a plague study conducted at Gallup, New Mexico, at the request of the state health department) such outstanding success was effected that most of the participating FEST members received job offers from the state.[27]

The final training phase held Fort Bragg was a practical field exercise in which the field survey and laboratory skills of FEST members were utilized. These activities consisted of rodent collections, ectoparasite determinations, and tissue studies of collected animals

for possible natural infections such as leptospirosis, which was known locally in World War II as "Fort Bragg fever." Special Forces Vietnam returnees were studied for intestinal bacteria and for malabsorption, i.e. tropical sprue.[28]

Selected members received additional training at the Parachute Maintenance and Aerial Delivery School in Fort Lee, Virginia, and at the School of the Americas in Panama for the Jungle Operations Course. Four FEST clinicians attended the newly organized Tropical Medicine Course at WRAIR, beginning 6 June 1966. Other concurrent activities for the entomologist and the supply officer included design and development of many new and modified field survey equipment items suitable for remote area operations, e.g. man-pack versions of mosquito trapping devices, and provisions for field data collecting devices compatible with mechanical and electronic data processing equipment.[29] Further in-country tactical training for FEST members was to be accomplished by the 5th Special Forces Group (Airborne) upon arrival in Vietnam.

PRE-DEPLOYMENT UNCERTAINTIES

Armed with stateside support and guidance from the Director, WRAIR, MAJ Legters departed for Vietnam in August of 1965 to assess the realities and requirements for conducting research in Vietnam. The trip was only partially encouraging. Despite the full support of the 5th Special Forces Group Commander, no equivalent enthusiasm was voiced by LTC Stefano Vivona, MC, Chief, MRT in Saigon. LTC Vivona's coolness was apparently the result of an honest appraisal that MRT could readily perform the mission of conducting medical research in South Vietnam with existing personnel assets. Observed in the context of a period prior to the massive U.S. buildup in Vietnam, it may well have been a legitimate view. However, considering the opportunities for exploiting the country-wide spread of Special Forces A-Camps for medical researchers, the lack of support by MRT appeared to be more parochial than objective.[30]

As part of his fact-finding trip, MAJ Legters accompanied the incoming Group Surgeon of the 5th Special Forces Group, CPT (later COL) Craig H. Llewellyn, MC, on a detailed familiarization tour of many Special Forces locations within South Vietnam This served a dual purpose of gaining first hand knowledge of the wide ranging medical problems and the peculiarities of the isolated Special Forces camps, where he envisioned implementing his research protocols and solidifying the relationship with the 5th Special Forces Group.

Original planning envisioned close operational ties with the 5th Group, rather than integration as part of MRT. However, that soon became subordinated to the demonstrated need for closer ties to MRT. A joint trip report was drafted with CPT Llewellyn. The report was essentially self-serving in highlighting those problems which could not only be studied, but which would also be of assistance to Special Forces. Legters was due to brief this report to COL Spurgeon Neel, the U.S. Military Assistance Command Vietnam (USMACV) Surgeon. Due to transportation changes necessitating Legters' immediate departure, CPT Llewellyn was left in the critical position of advocating the need for FEST in Vietnam.[31] Support by the USMACV Surgeon was important, since WRAIR did not have the authority for sending FEST into the Vietnam Theater. A request for the FEST had to be generated by either U.S. Army Vietnam (USARV) or MACV to get the necessary space increase authorization. Support of the USMACV Surgeon was indeed a critical pivot point. Legters returned to CONUS (continental United States), filed his report, and received the necessary guidance from WRAIR to proceed with organizing the Field Epidemiologic Survey Team.

Based on his findings concerning potential military problems in Vietnam and assessment of opportunities to attack long standing research problems, Legters spurred his team to develop research protocols for the study of specific problems. The development of these protocols by team members illuminated needs for specific techniques, equipment, and other requirements, allowing the planning of appropriate training. Yet, at this stage the recruitment and training of personnel proceeded without any permission to enter Vietnam. By January of 1966, deployment to Vietnam appeared imminent, with WRAIR sending a letter through channels, proposing February deployment.[32]

The resulting flurry of last minute deployment preparations quickly evaporated into gloom, when it became apparent by February 1966, that no request for the FEST was forthcoming from the U.S. Command in Vietnam. Only Legters' unwavering optimism and faith in FEST capabilities kept the team intact. Exploratory efforts to send a section of FEST to Thailand, instead of Vietnam, met strong resistance again in the person of COL Vivona, who by now was the Chief of U.S. Army Medical Component SEATO in Bangkok. This time, however, Vivona was on solid ground for opposing the deployment of FEST to Thailand. Any U. S. military increase in Thailand, especially Special Forces personnel, was a potentially explosive issue to the sensitive Thais.[33]

The on again-off again nature of deployment was prolonged until July 1966 when Legters returned to Southeast Asia on a final attempt to resurrect the mission. He was quickly able to assess the changing nature of the war effort in Southeast Asia and was able to marshal support from Military Assistance Command, Thailand (MACTHAI) for recognition of FEST capabilities. FEST was to add a new capability to operate in areas that were inaccessible to the

personnel of the U.S. Army Medical Component SEATO. An "Urgent Request for Deployment" was drafted by the J-3, MACTHAI for deployment of FEST personnel. The FEST component was to be satellited on both the U.S. Army Medical Component SEATO in Bangkok and the 46th Special Forces Company in Lopburi.[34]

Legters sent a letter from Thailand outlining anticipated activities, the possibilities of working with the Thai Special Forces, and the United States Overseas Mission (USOM) Medical Civic Action Program.[35] He gave instructions to revise a number of protocols in anticipation of projected changes in focus on the diseases to be studied.[36]

On the 19th of July, Maj Legters continued on to Vietnam for discussions with the third chief of MRT, LTC (later COL) Robert J.T. Joy, MC, who gave him his wholehearted support for bringing the FEST to Vietnam. Accompanied by the MRT chief, Legters visited both the USARV and the MACV Surgeons. With the concurrence of both, Joy submitted a letter to HQ, USARV for an increase in 19 spaces to MRT.[37] The request cited a need to balance the research capabilities of MRT, commensurate with the vast buildup in Vietnam. Joy indicated that augmentation by 15 September 1966 was vital, in order to begin studies of malaria and dengue during their seasonal cycle. He also cited the need to begin a backlog of studies, many of which were to be conducted in militarily hazardous areas, such as isolated Special Forces camps.[38] On 3 August 1966 the long awaited message finally arrived from USARV, stating "… Clearance for the increase of spaces has been approved by COMUSMACV and USARV has given in-country clearance."[39]

During the week of 10-11 August, COL Tiggertt visited the Center for Special Warfare and the FEST. There, he was presented with a Green Beret by the acting commander of the CSW. It was a fitting tribute to the man who initiated the formation of the U.S. Army Special Forces — Walter Reed Army Institute Field Epidemiological Survey Team (Airborne).[40]

Relationship with MRT

The advance element, consisting of supply officer CPT (later LTC) Louis T. Dorogi, MSC and SFC Thomas J. McMullen, arrived in Saigon on 5 September 1966 and hitchhiked to the Special Forces B-55 compound, located only a couple of blocks from MRT Headquarters at 149 Cong Ly. MRT did not get the information on arrival dates. By the end of October, the remainder of the FEST arrived. The officers were to be billeted at MRT, while arrangements were made to house the enlisted at various bachelor enlisted quarters around Saigon. MRT was located in the anterior portion of a modern four story Vietnamese maternity hospital on Cong Ly Street, directly across from the Pasteur Institute. MRT was attached to the 1st Logistical Command in Saigon for administration and logistics.[41] By the time FEST personnel arrived, it was a well coordinated and functioning organization headed by LTC (later COL) Harry G. Dangerfield, MC, its fourth chief. Later the unit was attached to U.S. Army Headquarters Area Command (USAHAC).

MRT had numerous advantages besides enjoying a favorable location halfway between downtown Saigon and Tan San Nhut Airbase. Its capability to draw on in-country supply sources, along with stateside supply support from WRAIR Special Foreign Activity, and if needed, from U.S. Army Medical Component SEATO, was unique. Additionally, it possessed a generous fund to meet emergency situations. It was organized into a number of sections, some of which were physically located in the facilities of the Pasteur Institute.

Within the MRT compound, the 521st Medical Intelligence Detachment and the Central Processing Laboratory of the 20th Preventive Medicine Unit were temporarily housed. TDY teams from CONUS under the guidance of WRAIR were also sent to Vietnam to focus on short range studies, primarily at hospitals. With the exception of a few "field" studies by Captains Anthony T.C. Bourke, MC, and Peter G. Bourne, MC, the majority of the MRTV projects were conducted within a hospital or laboratory setting.[42] The arrival of Legters' team signified a shift in emphasis and capability towards "field" studies, whether with Special Forces or conventional units.

There were few major problems with MRT since both LTC Dangerfield and MAJ Legters were pragmatic and mission oriented. MAJ Legters realized early during his second visit to Vietnam that attempts to maintain separateness from MRT would jeopardize effective utilization of his team and for this reason worked towards a harmonious relationship with MRT.[43]

Figure 2: *LTC Legters and LTC Adams, WRAIR, meet with MG Steger.*
(Author's photo)

In Vietnam, FEST members wore the Green Beret with the 5th Special Forces Group flash and the Special Forces insignia on their left shoulder, while other MRT personnel wore baseball type caps with the 1st Logistical Command shoulder insignia, reflecting separateness not only in form, but substance.[44] The formal attachment of FEST to the 5th Special Forces Group (Airborne) enabled the FEST to operate in Vietnam virtually without question as members of the 5th Special Forces Group.[45] This not only enhanced their credibility as researchers, but on a more functional basis allowed them to be welcomed as qualified reinforcements in remote Special Forces camps where FEST was to conduct research. In these camps, only a dozen or so U.S. "Green Berets" advised their Vietnamese counterparts. Without Special Forces identification and qualification, FEST presence would have been burdensome, rather than reinforcing, and would hardly have been accepted. Attachment to the 5th Special Forces Group also had some practical advantages. MRT could provide nothing in terms of field gear, whereas the 5th was able to provide weapons, ammunition, clothing, organizational equipment, and vehicles. Also, the 5th Group's countrywide communications and aerial transportation system were now made available.

Medical Research in the Field

The opportunity to demonstrate the capabilities of the FEST came during Operation Paul Revere IV, a U.S. military operation conducted in the central highlands of II Corps tactical zone. Coordination with the Special Forces C Detachment at Pleiku and the 1st Company, Mobile Strike Force (more popularly known as the Mike Force), allowed FEST to study malaria incidence among indigenous and U.S. forces during combat operations.[46]

Malaria Studies

CPT (later COL) Andrew J. Cottingham, Jr., MC, and CPT (later BG) Stephen C. Boone, MC, headed a six-man team conducting the study. Both were well qualified technically and operationally, with Cottingham a graduate of the Jungle Operations Course and Boone the honor graduate of the Recondo Course conducted in Nha Trang by the 5th Special Forces Group.[47] Their study was to be unique, since it was probably the first instance where medical research was conducted under combat operations. The background to this study could be found in the observations of Special Forces personnel commanding the indigenous irregular Mobile Strike Forces. They noted that the combat effectiveness of indigenous forces was severely curtailed after five to seven days of operations. Variously attributed to laziness, dietary deficiencies, deficient stamina, or illnesses, the explanations were inconsistent. Concurrently, the 5th Special Forces Group had no policy of placing the indigenous troops on prophylaxis against malaria. There was a popular assumption that the natural immunity or resistance of those who lived in hyper-endemic malarial areas would be adequate protection.[48] Also there was an acute awareness of possible hemolysis resulting from administration of certain antimalarials to those deficient in glucose-6-phosphate dehydrogenase (G6PD). Black Americans with this deficiency were known to be susceptible to hemolysis from dapsone (DDS) and primaquine. The severity of Caucasian and Chinese variations of G6PD deficiency was legitimate cause for worry in considering antimalarial prophylaxis for indigenous troops. There were no studies in existence at that time on G6PD deficiency within the ethnic Montagnard tribes of Vietnam, the major source of indigenous mercenaries recruited by Special Forces.[49] Another primary consideration for study was the general suspicion that infected enemy troops were the primary sources of malarial infection for U.S. troops on combat operations. There was no definite proof since previous data were confused by the presence of considerable numbers of infected civilians in the areas of operations. Operation Paul Revere IV occurred in an area devoid of civilians, and thus afforded the opportunity to study malarial incidence in enemy held areas.[50] It was also known that there was significant prevalence of parasetemia among asymptomatic indigenous troops in the II Corps area. These troops were seemingly unaffected by the parasites during routine garrison duty, but often came down with clinical malaria when introduced into combat. There was suspicion that physical and mental stress (combat) could contribute to development of clinical malaria.

Pre-mission thick and thin blood smears, collected in Pleiku prior to the deployment of the 1st Company, Mike Force, established a 58% *P. falciparum* malarial infection rate and a 1.6% *P. vivax* infection rate among indigenous troops examined. Parasetemia levels were universally low.[51] Within Special Forces personnel in the same unit, none were found to be infected prior to combat operations.

Interestingly, once the 1st Company, Mike Force was committed to action on 13 November 1966, two separate outbreaks of malaria occurred. Five cases of clinical malaria appeared between 16 and 20 November. These cannot be attributed to infection after the onset of the operation, since the classic incubation period for *P. falciparum* malaria is 10 to 14 days.[52]

It was followed by a massive outbreak of malaria beginning immediately after the 1st Company, Mike Force was extracted by helicopter from the operational area. Between 24 November and 10 December, 43 indigenous troops came down with clinical *P. falciparum* malaria.

Figure 3: *CPT Cottingham conducting sick call near Dak To to get cooperation of villagers to participate in malaria study. (Photo – courtesy of CPT Cottingham)*

Pre and post-mission medical studies were correlated with medical data and observation during the combat operation. This material was analyzed in terms of the operational data provided by the 1st Company, Mike Force. The results showed significant applicability to future operations. Prior semi-immunity among indigenous troops was shown to be inadequate protection against acquisition of new infections arising from operations in malaria endemic areas. Malarial rates were compared to U.S. units operating in the same general area during the same period and were found to be significantly higher (25.6 cases per thousand man combat days of exposure) than in U.S. units on antimalarial drugs.[53] Peaks in malarial outbreaks in the other U.S. units were also correlated to contact with North Vietnamese Army (NVA) forces. Essentially, it was the same experience that the 1st Company, Mike Force had encountered during November. This reinforced the belief that NVA troops constituted a primary reservoir of malaria.[54]

Chloroquine insensitivity of *P. falciparum* was found to be high among infected troops, both in those who were infected prior to Paul Revere IV (82.4%) and among those who were presumably infected in the operational areas (80%). This factor confused interpretation of the chloroquine insensitivity in the *P. falciparum* strains identified.

Further studies of blood from 59 indigenous Montagnard troops conducted at the Department of Medicine, University of Chicago, revealed an 8.5% rate of Caucasian type of G6PD deficiency. This finding confirmed the possibility for massive hemolysis from administration of antimalarial prophylaxis to indigenous troops.[55]

The same investigators began a broad based study in January 1967 to collect data on malaria prevalence and chloroquine insensitivity in western II, III and IV Corps tactical zones. In February, another malaria prevalence survey of the 1st Company, Mike Force, was conducted. A 30.1% prevalence was found, versus a previous 59.7% rate in November. This decrease was significant, since after Operation Paul Revere IV this same unit had been placed on intermittent weekly chloroquine and daily dapsone only during subsequent military operations. Studies in II Corps further found that CIDG troops had consistently one half of the civilian malarial rate for P. *falciparum*, probably due to availability of medical care.[56] At the Dak To Special Forces camp located in II Corps Tactical Zone, chloroquine sensitivity tests of patients showed only a 19.1% insensitivity, versus an 80% prevalence. It was presumably caused by the presence of North Vietnamese troops in the area.

Within western III Corps, around the periphery of the Special Forces B-Detachment of Song Be, the malarial rates for both villagers and CIDG differed significantly, with a *P. vivax* rate of 23.3% versus only a 2.5% *P. falciparum* rate. A byproduct of this study was a 14.9% prevalence of microfilariae, indicating possible long range problems for U.S. personnel operating in the area. This became the impetus for further studies on filariasis.[57]

Of major importance was the identification of significant chloroquine insensitivity (47.8%) of clinical malaria cases in the "Seven Mountains" area of IV Corps. This sharply circumscribed area was almost a separate ecological entity. The Seven Mountains (between 500 and 700 feet high) are virtually the only elevated areas within the Delta region of Vietnam. It had been a Viet Cong controlled area for a long time. The high rate of insensitivity was surprising, in that previously there were no similar problems. In April and May, a number of Special Forces out of Ba Xoai were infected with *P. falciparum*, despite being on routine chloroquine-primaquine prophylaxis. Investigation of this problem led FEST members to conclude that previously unidentified NVA troops were operating in the Seven Mountains area. A confidential report was prepared to this effect, with a recommendation for immediate administration of daily dapsone to all personnel in Ba Xoai, in addition to the weekly administration of chloroquine-primaquine.[58] The report on NVA presence was soon confirmed by intelligence sources.[59]

Vector Studies

Parallel to the malaria study efforts, the field survey section of the FEST conducted studies of malaria vectors in western II and IV Corps tactical zones. CPT (later LTC) Ray E. Parsons, MSC, the section chief, directed the studies. He was the first entomologist to serve in that capacity within Special Forces.

During November and December, FEST conducted mosquito surveys to establish the primary malaria vectors in the area of operations for Paul Revere IV. A base laboratory was initially established at the C-Detachment in Pleiku, but was quickly moved to the Plei Djereng Special Forces camp to facilitate transportation of specimens for processing.[60]

Figure 4: *CPT Parsons dipping for mosquito larvae in Song Be. (Author's photo)*

The mosquito collections were conducted in conjunction with patrol activities of the 1st Company, Mike Force and at the artillery fire support bases for the 4th Infantry Division. The principal method of mosquito collection was the man-biting technique, where one member of the team bares a part of his body to attract the feeding mosquito. Security permitting, red filtered flashlights were employed to aid in capturing mosquitoes. This was accomplished by placing small plastic vials over the mosquitoes. The vials were sealed by wads of cotton until the mosquitoes were dissected or killed (via chloroform) for further taxanomic study. Another collection tool was the battery powered light trap. Daytime collections were made with aspirators or vials at resting sites of the mosquitoes (walls, bunkers, etc.). Larval collections were made by dipping white enameled dippers into likely mosquito breeding sites, such as stagnant pools, water filled bomb craters, and moisture filled depressions in trees.[61] The larvae were placed in 70% alcohol and shipped to the Institute Pasteur for identification and mounting.[62]

Parsons had broad objectives, namely the collection of basic ecological, taxonomic, and distribution data on all genera of mosquitoes for possible use in on-going and future studies of malaria and other mosquito related diseases. To this end, he felt that a number of permanent base camps should be established to give an in-depth picture of the seasonal mosquito population variation and problems associated with mosquito vectors. Dak To, a Special Forces camp in northwestern II Corps, was selected as one site because it was representative of Western Highlands ecology. In addition, it was near the operational areas of Paul Revere IV. Readily accessible by air, the camp location simplified potential communications and logistics problems. Additionally, studies by other FEST members of a recent plague outbreak in the camp were in progress. This location allowed more economical use of personnel. Later an alternate site was established at the Special Forces camp at Dak Pek, north of Dak To. Due to poor accessibility, that site was infrequently used.

The second permanent study site was established at the Ba Xoai Special Forces camp at the base of the Seven Mountains area of IV Corps. Clinical studies established the camp as being located in an area endemic to *P. falciparum* malaria. The prevalence of malaria decreased abruptly with increasing distance from the "mountains". It was suspected that the "mountains" (prominent terrain features in an otherwise flat area) held the key to malaria transmissions.

At the Dak To Special Forces camp, FEST accomplished malaria prevalence studies in March 1967, followed by adult and larval control collections in the camp vicinity. Following area mosquito control measures (i.e. aerial spraying and ground fogging), further studies allowed comparison to previously cited baseline data. Results showed only a temporary decrease in mosquito larval counts within open areas around the Special Forces camp, raising questions about the effectiveness of aerial spraying methods used in the area for malarial control. Breeding and biting habits of anopheline mosquitoes were also correlated to seasonal changes in malarial rates.[63]

The strategic location of Dak To, astride one of the main infiltration corridors into the Western Highlands of Vietnam, was emphasized by a multi-battalion NVA attack against the camp on 16 June 1967. The attack followed on the heels of an ambush which on 15 June 1967 virtually decimated one company of the Mobile Strike Force operating out of Dak To. The predawn attack on the camp pinned down most of the CIDG defenders and their U.S. and Vietnamese Special Forces advisors, with mortar and machinegun fire. The defenders were caught by surprise and most were unable initially to return fire from their crew served weapons, except for one man. SFC (later MSG) Edward W. Davis, preventive medicine specialist for the FEST, was in Dak To conducting live rodent trapping in the vicinity of the camp the day before the attack. Davis single-handedly operated and fired the camp's only 4.2 inch mortar, a procedure normally requiring a multiple man crew. When the volume of incoming fire be-

came too heavy around his above-ground position, he ran to and operated an 81mm mortar by himself, bringing fire on the enemy entrenched on the ridge line, overlooking the camp. Davis was wounded during one of his attempts to man the camp's mortars, but still managed to treat other wounded personnel.

Meanwhile, SFC Leslie G. St. Lawrence, the other FEST preventive medicine specialist at Dak To, exposed himself to enemy fire numerous times, aiding other wounded, while he himself received fragment wounds. An officer, who had one leg virtually severed at thigh level and the other leg severely injured due to a nearby blast from an 82mm mortar round, collapsed near St. Lawrence. Wounded and blown off his feet at least twice in the process of trying to stem the bleeding, the NCO succeeded in getting help to get the wounded man into a bunker for treatment. Both NCOs were later awarded the Silver Star and the Purple Heart for their actions.[64]

Figure 5: *LTG Leonarg G. Heaton, the Surgeon General, presenting SSG Leslie St. Lawrence with the Silver Star. (Author's collection)*

Later that same day, elements of the 173rd Airborne Infantry Brigade arrived to relieve the garrison and begin operations in the vicinity of the Special Forces camp. These developments provided the opportunity to evaluate mosquito control measures such as ground fogging and aerial spraying and the ecological impact of large-scale operations in an area for which baseline malaria and mosquito data were available.[65]

PLAGUE STUDIES

Dak To was also the focus for a very important plague survey conducted earlier that year between 21 February and 2 April 1967. Bacteriological confirmation of bubonic plague was obtained in ten personnel, while serologic confirmation resulted in two out of 20 suspected

Figure 6: *LTC Legters taking throat cultures during plague outbreak at Dak To. (Photo courtesy of CPT Cottingham)*

cases. Diagnosis in the other eight cases was presumptive. The bimodal epidemic peaked three weeks apart.[66]

There were four deaths attributable to *P. pestis* (later renamed as Yersinia or *Y.pestis*). Further, a much higher attack rate was observed among CIDG dependents than among the troops, indicating a probability of plague transmission occurring within the underground CIDG dependent housing area. These were the first bacteriologically confirmed plague cases in Kontum Province, though four months earlier suspect cases were noted in Kontum City. Interestingly, at the same time as the Dak To outbreak, similar outbreaks occurred in Nha Trang, where the Special Forces Logistical Support Center (LSC) was located. The possibility of plague introduced via routine delivery of supplies had to be acknowledged.[67]

Figure 7: *SGT Stern and CIDG troops setting rodent traps. (Author's collection)*

Studies on the ecology of the outbreak were initiated in April. Trapping of rodents within the camp and adjacent areas, including neighboring Montagnard villages extended over a four month period. Sentinel mice were used as another collection method.[68]

Most importantly, subclinical plague was demonstrated and was thought to be the reason for the relatively low casualty rate. This was observed in the decreasing severity of cases as the outbreak progressed. Apparently, those with a subclinical infection developed protective antibodies. They came down with only a mild ambulatory form of plague, called pestis minor, when exposed to a large infective dose of *P. pestis*.[69] The adequacy and effectiveness of streptomycin in two to three gram daily doses was demonstrated when LTC Legters himself was treated for plague (*P. pestis*), during the course of the study.[70] In April, the FEST observed a possible pneumonic plague outbreak in IV Corps in its first non "field" oriented study. Evidence of *P. pestis*, found in throat cultures of five pediatric patients at Kien Giang Hospital, precipitated the study. Results from the brief study proved inconclusive as to the specific etiologic agent responsible for the fatal respiratory epidemic.[71]

Figure 8: *(SFC Melton and SSG Moore) SFC Melton and SSG Moore processing rodent for plague study. (Author's collection)*

SCRUB TYPHUS

During Operation Paul Revere IV, initial evidence was found to classify scrub typhus as a significant military medical problem. Sixteen personnel out of 110 in the 3rd Company, Mike Force, showed clinical evidence of scrub typhus, in addition to one case among its U.S. Special Forces cadre. The 1st Company suffered somewhat fewer cases of scrub typhus. Isolates of the causative agent Rickettsia *tsutsugamushi* (later renamed *Orienta tsutsugamushi*) were obtained from two indigenous members of the 3rd Company, while use of an immunofluorescent (IF) technique provided supportive evidence.[72]

The second major outbreak of scrub typhus occurred during 18-21 December 1966 among members of a 34-man reconnaissance platoon from the Binh Thanh Thon Special Forces camp. The unit was on a training exercise near Dong Ba Thin in the southeastern II Corps area and operated in areas heavily covered by low scrub type of vegetation. Review of scrub typhus diagnoses at the 8th Field Hospital in Nha Trang and at the 93rd Evacuation Hospital at Bien Hoa indicated the occurrence of scrub typhus in widely scattered locations within II and III Corps.[73]

In an attempt to define the ecology of scrub typhus and establish possible chigger mite vectors, CPT Parsons and members of his field survey section initiated two surveys at Dak To and Dong Ba Thin, respectively. At Dak To, the presence of a multi-battalion NVA force curtailed operations after two months. Marked differences were found in the species of mites or animals trapped in the two locations. Blackplating in scrub areas was quite successful in mite collections. One hitherto unknown species of chiggers not previously recorded in Vietnam was found.[74]

Figure 9: *SFC Chavers and CIDG troops going on patrol at Dong Ba Thin. (Author's collection)*

The study had to be terminated prematurely since two companies of NVA troops were observed to be moving into the area. These were more than a match for the small CIDG security force accompanying the FEST. Verification of scrub typhus presence in the Dong Ba Thin area came about when one of the FEST research personnel exhibited classical clinical symptoms of scrub typhus at the closing stages of the study.[75]

SPLENOMEGALY

In other studies, CPT (later LTC) Edward J. Colwell, MC studied the "big spleen" syndrome in I and II Corps, finding that splenomegaly in the indigenous population was probably attributable to chronic *P. vivax* and *P. falciparum* infections in the Mekong River Delta area, while *P. malariae* was found in 10% of tribesmen examined at the Gia Vuc Special Forces camp. Splenic enlargement was attributable to specific hepatic disorders.[76] In other studies

on precise histopathologic definition of hepatic disorders, Colwell and his collaborators found it necessary to perform closed liver biopsy or aspiration for specific diagnosis, because of the similarity of previous clinical and laboratory diagnoses among the various acute and chronic hepatic disorders. They made the observation that physicians working in underdeveloped areas could compensate somewhat for limited diagnostic capabilities and overburdened surgical services by mastering closed liver biopsy and aspiration techniques for hepatic diagnosis.[77]

Leptospirosis

Leptospirosis studies by CPT Howard L. Lipton, MC, did not find statistically large numbers of infected troops, but demonstrated that the possibility for infection was wide ranging. Studies of Marines at the then Special Forces camp at Khe Sanh, in I Corps and later with the 199th Infantry Brigade during Operation Fairfax (27 April-6 May 1967) north of Saigon, suggested the occurrence of subclinical or asymptomatic infections on the basis of serotiter elevation, but found no clinical illness.[78]

Schistosomiasis

The confirmed presence of schistosome foci along the upper reaches of the Mekong River in Laos and Thailand suggested that foci for the disease might also exist further south. Therefore, prospective studies for locating possible human schistosomal endemic areas within the Mekong River Delta were urgently needed in view of the serious problems with the disease encountered by American Forces elsewhere in World War II. Extensive tests were conducted by CPT Stephen C. Boone, MC, and his assistants, using three different kinds of skin tests, serum collections for fluorescent antibody testing, stool examinations, and rectal mucosa biopsies.[79] Though a significant number of positive reactions occurred in the skin tests, infections could not be demonstrated in skin test positive individuals by rectal biopsies or multiple stool examinations. Findings pointed to possible zoophilic schistosomes as the source of antibodies.[80]

Further Studies

By August 1967 individual replacements for FEST began to arrive, bringing two new skills — those of the veterinary and clinical laboratory officers. LTC (later COL) Charles R. Webb, Jr., MC, replaced LTC Legters as Deputy Chief, MRT and Chief, FEST. MRT added a new trauma study section. The methods of operation remained basically the same, with continuance of previously initiated studies and some new targets of opportunity, but with a new veterinary dimension added.

Figure 10: *CPT Boone and SFC Wellington collecting snails in a canal for schistosomiasis study. (Photo – courtesy of CPT Boone)*

Tropical sprue studies initiated by Collwell and his associates were continued and expanded upon by CPT Donald Catino, MC. He and his predecessors studied a volunteer group of 69 Special Forces Soldiers in the Mekong River Delta over a 17-month period (January 1967 — May 1968). They found that in 13 cases "…the incidence of sprue rose with increasing duration of exposure to a peak of 28% at 9 to 14 months in Vietnam…"[81] No evidence was found in the group of an increase in incidence due to dietary deficiencies. Other data noted focal points for sprue at the Special Forces camps in the U Minh Forest and the Plain of Reeds, with a peak incidence during the hot dry season. Catino found that "… sprue patients exhibited a spectrum of diseases from subclinical to the overt sprue syndrome. None became malnourished or anemic… no quantitative nor qualitative abnormalities were noted in jejeunal bacteria of patients …" and "… enteric bacterial pathogens and parasites were present only as coincidental or secondary invaders in patients with sprue …"[82]

Continuance of malarial studies on the Mobile Strike Forces and CIDG in II and IV Corps led the principal investigators, CPT Richard N. Roger, MC and LTC Charles R. Webb, Jr., MC to observe a marked reduction of indigenous malarial prevalence rates. This decline was primarily attributable to the introduction, in November 1967, of weekly chloroquine phosphate chemoprophylaxis for some Mike Force troops. Additionally, malarial prevalence at the Ba Xoai Special Forces camp in January 1968 was 2.5% versus 48.7% in May of the preceding year. The seasonal variations of mosquito populations, chemoprophylaxis, as well personnel turnovers among the CIDG, were deemed responsible.[83] However, in the III Corps tactical zone a major malaria outbreak among Mobile Strike Forces demonstrated the wide variety of responses to malaria among indigenous populations. The 2000 man Mike Force

was primarily made up of ethnic Khmers from the Delta area in VI Corps, where there was generally low malaria incidence. CPT (later COL) Stephen C. Hembree's exhaustive study of this outbreak showed a classic case of a non-immune unit being rendered combat ineffective by malaria. Over half of the Mike Force was shown to be previously malaria-free during a previous survey. The unit was deployed on Operation Centurion VIII in the Long Khan Forest in III Corps when the outbreak occurred. The hundreds of acutely ill evacuees overwhelmed the 100 bed CIDG hospital in Bien Hoa. A stand down of several weeks was required before the Mike Force unit could be returned to combat operations.[84]

Another valuable study of malaria in the II Corps Mobile Strike Force, during a combined operation with units of the 173rd Airborne Brigade and the 4th Division at Dak To, provided an opportunity for a comparative study of malaria in semi-immune (Mike Force) and non-immune (U.S.) personnel. The study revealed that conventional U.S units in the same areas of operation had a much greater problem with clinical malaria than Montagnard soldiers, in spite of command programs of malaria discipline. A further investigation at 28 Special Forces camps during February-July 1969 revealed an overall 8.66% prevalence rate for malaria, among 4,827 CIDG.[85] Other studies, by the second contingent of FEST involved malaria prevalence and chloroquine sensitivity studies among Viet Cong and NVA prisoners of war and studies of malaria vectors in western IV Corps.

Filariasis studies in western II Corps among indigenous and U.S. servicemen revealed a 4 to 8% incidence in Montagnards, but none in Vietnamese. Though only one U.S. Soldier was found to have microfilaremia, the possibility of other infections could not be discounted due to the nature of the disease.[86] Due to little information being available on the country-wide distribution of filariasis, a series of studies were made at 28 selected Special Forces camps throughout South Vietnam by FEST parasitologist, CPT Hembree, and staff. Demographic data was collected, blood samples from finger punctures were drawn, glass slides were prepared and examined under higher magnification, and data was analyzed. While the data showed filariasis present in 11 of 28 Special Forces camps, the researchers were able to reach only general conclusions as to geographic distribution from the small sample of the 4,575 CIDG. There were no microfilariae among the CIDG in I Corps and an insignificant number in IV Corps. II Corps and III Corps were identified as the more highly endemic areas with the highest rate, 12.5%, found at the Duc Phong Special Forces camp in Phuoc Long Province.[87]

Prior to "de-establishment of FEST as a distinct entity within MRT, CPT (later COL) Alfred M. Allen, MC, began a major study on skin diseases among U.S. troops in the IV Corps tactical zone. In collaboration with Dr. David Taplin of the University of Miami, Allen and FEST staff studied what was a leading cause of disability, visits to aid stations, and inpatient hospitalization in Vietnam. Their research with the 9th Infantry Division resulted in more effective measures in prevention and treatment of skin diseases. Subsequently, Allen authored a volume on skin diseases in Vietnam for the Center of Military History.[88]

Medical Supply

As elsewhere in Vietnam, one of the most vexing problems for FEST was supply. The Team's advance element, consisting of the medical supply officer and NCO, arrived in country on 5 September 1966 to discover that only a part of the supplies and equipment ordered by them at Fort Bragg had arrived safely. A significant and vital portion had been sunk on a cargo ship hit by Viet Cong fire, as it was nearing Saigon's river port. Though some of the cargo was salvaged from the river bottom, these were almost universally unfit for subsequent use. With only two weeks remaining before the rest of FEST was due to arrive, frantic efforts were made to determine the extent of loss and acquire substitute items from in-country sources, as well as reordering from WRAIR.[89]

Figure 11: *CPT Hembree at Bu Dop in 1968. (Photo – courtesy of CPT Hembree)*

Figure 12: *CPT Dorogi with district chief and interpreter at Khe Sanh Village during resupply mission. (Author's Collection)*

Due to the non-standard nature of much of the supplies, little help could be obtained from the 32rd Medical Depot in Saigon. Only the invaluable help of the supply officers from the 9th Medical Laboratory and the 3rd Field Hospital in Saigon averted a costly delay. That, coupled with a healthy smattering of "scrounging" from other units, enabled FEST to begin operations as the remainder of the Team arrived.

Illustrative of the supply problems encountered was the method of transporting and refilling liquid nitrogen containers used for research specimens acquired in the field.[90] Liquid nitrogen was to be readily available once FEST began operating in Vietnam. However, the initial formal request by FEST for forty gallons was disapproved by the Air Force at Tan San Nhut. It remained for the supply section to resolve the problem on an informal basis — trading of C-rations in sufficient quantities enabled ready access to as much liquid nitrogen as was needed.

Another seemingly insurmountable problem was that Pacific Air Force (PACAF) regulations prohibited the transport of noxious gases and chemicals on the same aircraft with troops. This caused a real dilemma for FEST since the extraction of medical specimens, collected many times under hazardous conditions, could not be guaranteed safe and timely delivery on cargo aircraft. Once again an "unorthodox" procedure solved the problem. Liquid nitrogen-identifying labels were conveniently replaced by labels attesting to the contents as dry ice! The potential hazard of spillage was eliminated by use of absorbent filler inside the liquid nitrogen container.

WRAIR's multiple supply channels and funds were a decided advantage for FEST support. MRT had numerous out-of-country supply sources that could be utilized. Despite these advantages, FEST had numerous in-country supply problems to contend with:

1. Deterioration of consumables due to lack of adequate storage facilities at the operational sites.
2. In-country transportation problems due to long lead times required to manifest and ship supplies, causing continual attempts to circumvent the existing transportation system.
3. Numerous research protocols, drafted in-country to exploit medical problems that arose during FEST's stay in Vietnam, left little time for acquisition of supplies and equipment.
4. Extreme difficulty with accountability for major line items of equipment, due to the continual mobility/relocation of FEST sections.
5. Necessity for accompanying any and all supply shipments, since there was little guarantee of timely or safe arrival. This required at least one FEST member to accompany all shipments.
6. Poor communications due to country-wide operations.
7. Isolation of Special Forces camps due to weather and aircraft availability.
8. Continual refill and shipment of liquid nitrogen containers.
9. Lack of organic TOE weapons, equipment, and vehicles.

The supply problems of the FEST were characterized by a continual need for unorthodox methods to accomplish the mission. The growing military bureaucracy, administrative "red tape," and a relatively slow supply system within Vietnam, forced FEST to find unique and sometimes bizarre ways of circumventing the system. "Scrounging" or trading, drawing as needed on the various supply channels of WRAIR, cajoling transportation personnel into assigning a higher priority for shipments than was routinely granted, circumventing existing regulations or bending them somewhat to fit the needs of the occasion, allowed a degree of success that otherwise could not have been attained.

EPILOGUE

In October 1968, FEST was deactivated as a separate section within MRT. The 1968-1969 Annual Progress Report for MRT stated that it was due to "…a realignment of all personnel along purely functional lines into a 'one lab' concept…" and "…cross-training and cross-assignment of Special Forces personnel into areas of interest traditionally reserved for 'non-airborne personne' and the latter into projects heretofore being pursued solely by Special Forces personnel…" While some former FEST Special Forces personnel in Vietnam remained in MRT positions identified as requiring Special Forces qualifications, FEST as a distinct entity was ended.[91]

This explanation is inadequate, for the "disestablishment" of FEST can be traced to the increasing problems faced by the second contingent of FEST. The departure of LTC Legters, whose dynamic leadership was the keystone of the whole FEST concept, was a critical factor. More significantly, the growing deterioration of interpersonal relationships between FEST and the rest of MRT triggered open dissension within these elements.[92]

Beginning with the period just before the Tet Offensive in 1968, FEST research activities suffered long delays due to combat conditions. The delays certainly affected continuity or the timeliness of studies where seasonal observations were essential. Also the growing conventionalization of the war deemphasized "field" studies and the importance of Special Forces. The attachment of FEST to the 5th Special Forces Group was terminated with the dis-

bandment of the FEST. Research efforts were refocused on the more traditional work conducted at hospital and laboratory level.

The initial FEST contingent trained together for almost nine months as a separate unit before deploying to Vietnam, while subsequent personnel arrived mostly as individual replacements. Personnel input and training declined thereafter. However, this deficit was partially alleviated by some former FEST personnel returning to Vietnam on TDY for specific short-range projects.

Yet, despite these changes, FEST performed exceptionally well as an elite field research unit. It proved conclusively that medical investigative skills could be readily taken to remote and hostile areas by men who combined medical/research skills with operational qualifications of Special Forces Soldiers and could function effectively in this role. Ability, training, and personal bravery helped the United States Army Special Forces — Walter Reed Army Institute of Research Field Epidemiological Survey Team to successfully carry out valuable experiments in field research in Vietnam.[93]

References / Endnotes

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2. The Agency for International Development (AID), the U.S. Army Special Forces and others in the U.S. Country Team.
3. Letter – The Surgeon General of the Army, *Military Medical Research and Service Program in Vietnam*, 16 January 1962.
4. Comment #4, dated 28 March 1962, to letter from The Surgeon General, Department of the Army to Chief of Research and Development, Department of the Army, *Military Medical Research and Service Program in Vietnam*, 16 January 1962.
5. Ibid, p. 3
6. Dirks, K.R., *The U.S. Army Medical Research and Development Effort in the Southeast Asian Conflict* (Student Research Report No. 9), Industrial College of the Armed Forces, Washington, 15 March 1972.
7. The U.S. Naval Medical Research Unit #2 in Taiwan; the 406th General Medical Laboratory, Camp Zama, Japan; and the Fifth Epidemiological Flight in Yamata, Japan.
8. Facility established by COL Tiggert in response to a plague epidemic in Saigon. The epidemic occurred during the course of his fact-finding tour. The physical site was furnished by the U.S. Army Support Group, Vietnam, but the facility was attached to the 8th Field Hospital in Nha Trang. See Tiggert, W. D., *Military Medical Research Program, Southeast Asia, Report of Survey Group, 17 July 1962*, 11 January 1963.
9. The diseases recommended for investigation were malaria, arthropod borne viral diseases, dysentery, cholera, plague, melioidosis, tuberculosis, typhoid fever, respiratory infections, leptospirosis, filariasis, dengue, and dengue-like fevers.
10. Op. cit., Tiggert, p.41
11. Disposition Form, Brigadier General Robert E. Blount, Office of the Surgeon General to Chief, Research and Development, *Military Medical Program, SE Asia*, 1October 1963.
12. *U.S. Army Medical Research Team (WRAIR) Vietnam and Institute Pasteur of Vietnam Annual Progress Report (1 October 1964-31 August 1965)*, 1965.
13. Staff Study, LTC Richard L. Coppedge, MC, Surgeon, U.S. Army Special Warfare Center, Fort Bragg, North Carolina, *Production of Medical Information and Intelligence in Special Warfare Operations*, 4 September 1962.
14. Paragraph 133, Special Order #68, dated 28 March 1963, as amended by AG letter dated 16 April 1963, Headquarters, XVIII Airborne Corps, Fort Bragg, NC.
15. These included skin testing, hemotologic observations, study of urine sediment, plus fecal, blood, and urine cultures. Liver function tests, bone marrow aspirates, or muscle biopsy and other studies were performed if indicated. Also see the staff study by LTC Coppedge.
16. LTC Thomas W. Sheehy, MC, from the Department of Cancer Gastroenterology, was interested in tropical sprue among Special Forces returnees. Evidence of abrupt weight loss and chronic diarrhea exhibited by a number of Special Forces returnees suggested this possibility. In cooperation with the CSW Surgeon's Office, a program to study malabsorption phenomena was initiated. Samples of intestinal mucosa were collected by means of the Crosby capsule, accompanied by studies for serum folate and carotene and d-xylose absorption. See interview with LTC Legters, pp. 4-5. Sheehy, T.W., Cohen, W.C., Wallace, D.K. and Legters. L.J., Tropical Sprue in North Americans, *Journal of the American Medical Association*, Vol. 194, p.1965 and Sheehy, T.W., Legters, L.J. and Wallace, D.K., Tropical Jejunitis in Americans Serving in Vietnam, *The American Journal of Clinical Nutrition*, Vol. 21, September 1968, pp. 1013-22.
17. Interview – COL Llewellyn J. Legters, MC, with MAJ Louis T. Dorogi, MSC, 8 April 1976, p. 6
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19. Op.cit., Interview, Legters, pp. 7-9
20. Ibid., p.8
21. Letter – COL William S. Gochenour, VC, Deputy Director, *Special Field Team for conduct of medical research in SE Asia*, HQ WRAIR, 27 January 1966.
22. Letter – Headquarters, U.S. Army John F. Kennedy Center for Special Warfare (Airborne), Fort Bragg, North Carolina, *The U.S. Army Special Forces-WRAIR Field Epidemiologic Survey Team (Abn)*, 22 June 1966.
23. Paragraph 201, Special Orders 90, Headquarters, Department of the Army, Washington, DC, 29 April 1966
24. Letter – COL William S. Gochenour, VC, Deputy Director, *WRAIR Augmentation of Special Field Team in conduct of medical research in SEASIA*, HQ WRAIR, 20 December 1966. The letter called for the CSW Surgeon to assist in selection and concur in assignment of individuals to FEST. Deployment of selected individuals was to be in the summer of 1967.
25. Disposition Form – The Office of the Surgeon, U.S. Army Center for Special Warfare, Ft. Bragg, NC to G-3, U.S. Army Center for Special Warfare, POI, *Pre-deployment Training for the U.S. Army Special Forces-Walter Reed Army Institute of Research Field Epidemiologic Survey Unit (Airborne)*, 10 December 1965
26. Ibid, p.4
27. Special Forces Unit in South Vietnam Aids Research Collecting, *Medical Tribune and Medical News*, Vol. 9, No.56, 11 July 1968, pp.1,20.

28. Letter for local distribution from HQ – U.S. Army John F. Kennedy Center for Special Warfare (Airborne), Fort Bragg , NC, *The U.S. Army Special Forces-WRAIR Field Epidemiologic Survey Team (Abn)*, 22 June 1966
29. Section II (Logistics) of ANNEX B (Research Plan) to *Proposal for the conduct of epidemiologic surveys and field trials of pro phylactic measures against certain infections in Viet-Nam*, HQ USA SF-WRAIR FEST (Abn), n.d.
30. Op. cit., Interview, Legters, pp. 8-9
31. Interview – LTC Craig H. Llewellyn, with MAJ Louis T. Dorogi, MSC, at Fort Detrick, Maryland, 8 January 1976, pp. 7, 21.
32. Op. cit., COL Gochenour Letter, 27 January 1966. The letter received strong endorsements from the CG, U.S. Army Medical R & D Command, The Surgeon General and CG, CONARC.
33. Op. cit., Legters Interview, p. 9
34. Letter – MAJ Llewellyn J. Legters, MC, from Bangkok, Thailand to CPT David E. Cundiff, MSC, HQ USA SF-WRAIR FEST (Abn), Office of the Surgeon, U.S. Army John F. Kennedy Center for Special Warfare (Airborne), Fort Bragg, NC.
35. The USOM Medical Civic Action Program Teams at that time were in a state of flux, moving their operations to the northwestern area of Thailand. Many of the enlisted personnel on these teams were TDY from the 1st Special Forces Group in Okinawa. The physicians were usually native Thai civilians who worked with the Civic Action Teams for about a month at a time. The method of operation was similar to MEDCAP in Vietnam.
36. Letter – MAJ Llewellyn J. Legters, MC, from Bangkok, Thailand to CPT David E. Cundiff, MSC, HQ USA SF-WRAIR FEST (Abn), Office of the Surgeon, U.S. Army John F. Kennedy Center for Special Warfare, Fort Bragg, North Carolina, 18 July 1966.
37. Letter – MAJ Llewellyn J. Legters, MC from Bangkok, Thailand, to CPT David E. Cundiff, MSC, HQ USA SF-WRAIR FEST (Abn), Office of the Surgeon, U.S. Army John F. Kennedy Center for Special Warfare, Fort Bragg, North Carolina, 26 July 1966.
38. Letter – LTC Robert J.T. Joy, MC, U.S. Army Medical Research Team (WRAIR) Vietnam to CG, U.S. Army Vietnam, ATTN: Surgeon, 25 July 1966. The letter was actually drafted jointly by Legters and Joy, based on the most practical schedule for introducing FEST personnel in-country.
39. Priority Message – 031038Z Aug 66, CG USARV to Director, WRAIR, WRAMC, Washington, DC, *Approval of In-Country TD Increase for USA Medical Research Team (WRAIR) Vietnam*, 3 August 1966.
40. Letter – COL (later MG) Albert E. Milloy, Acting Commander, U.S. Army John F. Kennedy Center for Special Warfare, Fort Bragg, NC to COL William D. Tiggert, MC, Director, WRAIR, WRAMC, Washington, DC, 2 August 1966. The CG of the Center for Special Warfare was originally asked to present the Green Beret to COL Tiggert. However, the CG, CSW disappeared during a return flight over the Pacific.
41. Section I, General Order 1783, HQ, U.S. Army Vietnam, 2 December 1965.
42. U.S. Army Medical Research Team (WRAIR) Vietnam and Institute of Pasteur of Vietnam, *Annual Progress Report (1 September 1965-31 August 1966)*, 1966.
43. Letter – MAJ Llewellyn J. Legters, MC in Saigon to CPT David E. Cundiff, MSC, HQ USA WRAIR-FEST (Abn), Office of the Surgeon, U.S. Army John F. Kennedy Center for Special Warfare, Fort Bragg, North Carolina, 26 July 1966.
44. FEST received from the Institute of Heraldry its own distinct Special Forces flash (black background with a maroon diagonal stripe) for wear on the beret. FEST never wore it in Vietnam and opted to wear the 5th Special Forces Group (Airborne) flash for the sake of expediency and to blend in better with 5th Group personnel. Only a few original FEST flashes were made at this time.
45. Paragraph 2, Section II, General Order 6067, HQ U.S. Army Vietnam, 18 October 1966.
46. Mobile Strike Forces (known as Mike Forces) were irregular indigenous troops recruited, trained, and commanded directly by U.S. Special Forces in Vietnam. As opposed to Civilian Irregular Defense Group (CIDG) forces, Mike Forces were directly under Special Forces control. All were to be parachute qualified.
47. Letter from General William C. Westmoreland, Commander, United States Military Assistance Command, Vietnam, *Letter of Commendation*, to Commanding Officer, U. S. Army Medical Research Team, 17 November 1966. The MACV Recondo Course trained mostly selected combat arms personnel in specialized skills and techniques considered essential for long range reconnaissance operations. It was a physically and mentally demanding course for personnel who would be expected to operate behind enemy lines. The course culminated in actual combat patrols conducted by the students.
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52. Op. cit., Interview, Legters, p.24
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93. FEST was a well decorated medical team with four Silver Stars, numerous other awards for valor and meritorious service, and credit for six unit awards, to include the Presidential Unit Citation. All FEST personnel qualified for receipt of the Combat Medical Badge.

Louis Theodore Dorogi, LTC, MSC (USAR Ret) eared his B.A. in history from Bowdoin College and a M.A.P.A. from the University of Oklahoma. His military career started in 1963 with a regular army commission through ROTC; in 1963, 82d Airborne Division, Fort Bragg; 1965 7th Special Forces Group (Abn), Fort Bragg; 1965 U.S. Army Special Forces-WRAIR FEST (Abn), Fort Bragg; 1966 U.S. Army Special Forces-WRAIR FEST (Abn), Vietnam, attached to 5th SFGA; 1968 Walter Reed Army Medical Center, Washington, DC; 1969 627th Hospital Center, Camp Zama, Japan; 1971 U.S. Army Hospital, Camp Zama, Japan; 1972 U.S. Army JFK Center for Military Assistance, Fort Bragg; 1975 XVIII Airborne Corps, Fort Bragg; 1975 Medical History Division, U.S. Army Center for Military History, Fort Detrick, MD; 1978 IRR; 1982 133d U.S. Army Reserve Forces School, Portland, ME; 1990 Retired. His civilian career includes: 1978 Assistant Director Health Program, Passamaquoddy Tribe, Princeton, ME; 1982 Director, Division of Licensing and Certification; 2005 Assistant Director, Division of Licensing and Regulatory Services; 2007 retired. He was an instructor on the Vietnam War, at Southern New Hampshire University from 1992 to 1995. Publications: (1990), Special Forces Medical Training 1952-1971, *Special Warfare*,3(1), 28-36.

Abstracts from Current Literature

Self-Reported Anabolic-Androgenic Steroids Use and Musculoskeletal Injuries

Horn S, Gregory P, Guskiewicz KM
Am J Phys Med Rehabil 2009;88:192–200.
Findings from the Center for the Study of Retired Athletes Health Survey of Retired NFL Players

Abstract

Objective: The relationship between musculoskeletal injuries and anabolic-androgenic steroids is not well understood. The purpose of our study was to investigate the association between self-reported anabolic-androgenic steroids use and the prevalence of musculoskeletal injuries in a unique group of retired professional football players. **Design:** A general health questionnaire was completed by 2552 retired professional football players. Survey data were collected between May 2001 and April 2003. Results of self-reported musculoskeletal injuries were compared with the use of anabolic-androgenic steroids using frequency distributions and $\chi 2$ analyses. **Results:** Of the retired players, 9.1% reported using anabolic-androgenic steroids during their professional career. A total of 16.3% of all offensive line and 14.8% of all defensive line players reported using anabolic-androgenic steroids. Self-reported anabolic-androgenic steroids use was significantly associated ($P < 0.05$) with the following self-reported, medically diagnosed, joint and cartilaginous injuries in comparison with the nonanabolic-androgenic steroids users: disc herniations, knee ligamentous/meniscal injury, elbow injuries, neck stinger/burner, spine injury, and foot/toe/ankle injuries. There was no association between anabolic-androgenic steroids use and reported muscle/tendon injuries. **Conclusions:** Our findings demonstrate that an association may exist between anabolic-androgenic steroids use and the prevalence of reported musculoskeletal injury sustained during a professional football career, particularly ligamentous/joint-related injuries. There may also be an associated predisposition to selected types of injuries in anabolic-androgenic steroids users.

Needle Versus Tube Thoracostomy in a Swine Model of Traumatic Tension Hemopneumothorax

John B. Holcomb, MD, John G. McManus, MD, MCR, S. T. Kerr, MD, Anthony E. Pusateri, PhD
Prehospital Emergency Care 2009;13:18–27

Abstract

Objective. Traumatic tension hemopneumothorax is fatal if not treated rapidly. However, whether prehospital decompression is better achieved by chest tube or needle thoracostomy is unknown. We conducted this study to compare the immediate results and prolonged effectiveness of two methods of treatment for traumatic tension hemopneumothorax in a swine model. **Methods.** Ten percent of calculated total blood volume was instilled into the hemithorax of spontaneously ventilating swine ($n = 5$ per group, 40 ± 3 kg). A Veres needle and insufflator were used to induce tension hemopneumothorax. Animals were randomized to one of four groups: 1) needle thoracostomy with 14-gauge intravenous catheter; 2) needle thoracostomy with Cook catheter; 3) 32-F chest tube thoracostomy; or 4) no intervention (control). Serial chest x-rays were obtained to document mediastinal shift before and after treatment. Arterial blood gas values and physiologic data were recorded. Postoperatively, thoracoscopy was performed to detect possible pulmonary injury from the procedure and/or catheter kinking or clotting. **Results.** Positive intrapleural pressure was rapidly relieved in all treated animals. Four-hour survival was 100% in the 14-gauge needle and chest tube thoracostomy groups, 60% in the Cook catheter group, and 0% in the control animals ($p<0.05$). There were no significant differences in survival or physiologic measurements among the treated animals ($p > 0.05$). **Conclusions.** In this animal model, needle thoracostomy using a 14-gauge or Cook catheter was as successful as chest tube thoracostomy for relieving tension hemopneumothorax.

Needle Thoracostomy for Tension Pneumothorax: Failure Predicted by Chest Computed Tomography

Robert L. Stevens, MD, Angel A. Rochester, MD, Jonathan Busko, MD, Thomas Blackwell, MD, Daniel Schwartz, MD, Anne Argenta, BS, Ronald F. Sing, DO
Prehospital Emergency Care 2009;13:14–17

Abstract

Objective: Tension pneumothorax can lead to cardiovascular collapse and death. In the prehospital setting, needle thoracostomy for emergent decompression may be lifesaving. Taught throughout the United States to emergency medical technicians (EMTs) and physicians, the true efficacy of this procedure is unknown. Some question the utility of this procedure in the prehospital setting, doubting that the needle actually enters the pleural space. This study was designed to determine if needle decompression of a suspected tension pneumothorax would access the pleural cavity as predicted by chest computed tomography (CT). **Methods:** We retrospectively reviewed consecutive adult trauma patients admitted to a level I trauma center between January and March 2005. We measured chest wall depth at the second intercostal space, midclavicular line on CT scans. Data on chest wall thickness were compared with the standard 4.4-cm angiocatheter used for needle decompression. **Results:** Data from 110 patients were analyzed. The mean age of the patients was 43.5 years. The mean chest wall depth on the right was 4.5 cm (±1.5 cm) and on the left was 4.1 cm (±1.4 cm). Fifty-five of 110 patients had at least one side of the chest wall measuring greater than 4.4 cm. **Conclusions:** The standard 4.4-cm angiocatheter is likely to be unsuccessful in 50% (95% confidence interval = 40.7–59.3%) of trauma patients on the basis of body habitus. In light of its low predicted success, the standard method for treatment of tension pneumothorax by prehospital personnel deserves further consideration.

Suicide among Discharged Psychiatric Inpatients in the Department of Veterans Affairs

Rani A. Desai, PhD; David Dausey, PhD; Robert A. Rosenheck, MD
Military Medicine Vol 173, No 8 August 2008

Abstract

Objective: The objective of this study was to explore correlates of the use of firearms to commit suicide. **Methods:** A national sample of psychiatric patients discharged from Department of Veterans Affairs medical centers was followed from the time of discharge until December 1999. The study explores state-level measures as correlates of overall suicide and suicide by firearm, controlling for individual sociodemographic characteristics and psychiatric diagnosis. The outcomes of interest were completed suicide and suicide by firearm. **Results:** Patients who were male, Caucasian, and who had a diagnosis of substance abuse or post-traumatic stress disorder were significantly more likely to use a firearm than another means to commit suicide. Multivariable models indicated that veterans living in states with lower rates of gun ownership, more restrictive gun laws, and higher social capital were less likely to commit suicide with a firearm. **Conclusions:** Gun ownership rates, legislation, and levels of community cohesiveness are significantly associated with the likelihood of psychiatric patients committing suicide with a gun.

Loss of Cabin Pressure in a Military Transport: A Mass Casualty With DecompressionIllnesses

Johnston MJ.
Aviat Space Environ Med 2008; 79:429-32.

Abstract
Presented here is the sudden cabin depressurization of a military C-130 aircraft carrying 66 personnel. They suffered a depressurization from 2134 to 7317m, resulting in a potential 66-person mass casualty. The aircrew were able to descend to below 3049m in less than 5 min. They landed in the Kingdom of Bahrain — the nearest hyperbaric recompression facility. Three cases of peripheral neurologic DCS and one case of spinal DCS were identified. Limited manning, unique host nation concerns, and limited available assets led to difficulties in triage, patient transport, and asset allocation. These led to difficult decisions regarding when and for whom to initiate ground level oxygen or hyperbaric recompression therapy.

Current and Future Cooling Technologies Used in Preventing Heat Illness and Improving Work Capacity for Battlefield Soldiers – Review of the Literature

O'Hara, Reginald; Eveland, Ed; Fortuna, Sarah; Reilly, Patricia; Pohlman, Roberta
Military Medicine, Volume 173, Number 7, July 2008 , pp. 653-657(5)

Abstract
Objective: The goals were to review the effectiveness of current cooling technologies used on the battlefield to reduce or to prevent heat illness in Soldiers and to discuss possible alternative or improved cooling methods. **Methods:** A search of the literature for 1990-2007 was performed by using the Air Force Institute of Technology and Air Force Research Laboratory search engines. **Results:** Several current cooling technologies are modestly effective in attenuating brain and core body temperatures, but the cooling effects are not sustained and the devices present operational problems. This review indicates that some current cooling devices are effective in lowering perceived efforts and lengthening maximal exercise time but are incompatible with current demands. **Conclusions:** Many of the cooling methods and devices detailed in the literature are impractical for use in the field. Future research should focus on cooling technologies that are practical in the battlefield and have sustainable cooling effects.

Combat Wounds in Operation Iraqi Freedom and Operation Enduring Freedom

Owens, Brett D. MD; Kragh, John F. Jr MD; Wenke, Joseph C. PhD; Macaitis, Joseph BS; Wade, Charles E. PhD; Holcomb, John B. MD
Journal of Trauma-Injury Infection & Critical Care. 64(2):295-299, February 2008.

Abstract
Background: There have been no large cohort reports detailing the wounding patterns and mechanisms in the current conflicts in Iraq and Afghanistan. **Methods:** The Joint Theater Trauma Registry was queried for all U.S. service members receiving treatment for wounds (International Classification of Diseases-9th Rev., codes 800-960) sustained in Operation Iraqi Freedom and Operation Enduring Freedom from October 2001 through January 2005. Returned-to-duty and nonbattle injuries were excluded from final analysis. **Results:** This query resulted in 3,102 casualties, of which 31% were classified as nonbattle injuries and 18% were returned-to-duty within 72 hours. A total of 1,566 combatants sustained 6,609 combat wounds. The locations of these wounds were as follows: head (8%), eyes (6%), ears (3%), face (10%), neck (3%), thorax (6%), abdomen (11%), and extremity (54%). The proportion of head and neck wounds is higher ($p < 0.0001$) than the proportion experienced

in World War II, Korea, and Vietnam wars (16%-21%). The proportion of thoracic wounds is a decrease ($p < 0.0001$) from World War II and Vietnam (13%). The proportion of gunshot wounds was 18%, whereas the proportion sustained from explosions was 78%. **Conclusions:** The wounding patterns currently seen in Iraq and Afghanistan resemble the patterns from previous conflicts, with some notable exceptions: A greater proportion of head and neck wounds, and a lower proportion of thoracic wounds. An explosive mechanism accounted for 78% of injuries, which is the highest proportion seen in any large-scale conflict.

Endotracheal Intubation Increases Out-of-Hospital Time in Trauma Patients

Michael T. Cudnik, MD, Craig D. Newgard, MD, MPH, Henry Wang, MD, MPH,
Christopher Bangs, MS, Robert Herrington IV,MD
Prehospital Emergency Care 2007;11:224-229

ABSTRACT

Objectives: Prior efforts have linked field endotracheal intubation (ETI) with increased out of hospital (OOH) time, but it is not clear if the additional time delay is due to the procedure, patient acuity, or transport distance. We sought to assess the difference in OOH time among trauma patients with and without OOH-ETI after accounting for distance and other clinical variables. **Methods:** Retrospective cohort analysis of trauma patients 14 years or older transported by ground or air to one of two Level 1 trauma centers from January 2000 to December 2003. Geographical data were probabilistically linked to trauma registry records for transport distance. Trauma registry OOH time (interval from 9-1-1 call to hospital arrival) was validated against a subset of linked ambulance records using a land-Altman plots and tested by using the Spearman rank correlation coefficient. Based on the validation, the sample was restricted to patients with OOH time 100 minutes or less. The propensity for OOH-ETI was calculated by using field vital signs, demographics, mechanism, transport mode, comorbidities, Abbreviated Injury Scale head injury 3 or greater, injury severity score, blood transfusion, and major surgery. Multivariable linear regression (outcome = total OOH time) was used to assess the time increase (minutes) associated with OOH-ETI after adjusting for distance, propensity for OOH-ETI, and mode of transport. **Results:** A total of 8,707 patients were included in the analysis, of which 570 (6.5%) were intubated in the field. Adjusted only for distance, OOH times averaged 6.1 minutes longer (95%CI 4.2-7.9) among patients intubated with RSI. After including other covariates, OOH time was 10.7 minutes (95% CI 7.7-13.8) longer among patients with RSI and 5.2 minutes (95% CI 2.2-8.1) longer among patients with conventional ETI. The time difference was greatest farther from the hospital. **Conclusions:** Patients with OOH-ETI have increased total OOH time, especially among those using RSI, even after accounting for distance and other clinical factors. Injured patients may benefit from airway management techniques that require less time for execution.

Naja Kaouthia: Two Cases of Asiatic Cobra Envenomations

Gautam Khandelwal MD, Kenneth D. Katz MD, Daniel E. Brooks MD, Stephanie M. Gonzalez MD and Colleen D. Ulishney CSPI
The Journal of Emergency Medicine Volume 32, Issue 2, February 2007, Pages 171-174

ABSTRACT

Envenomation from cobra bites causes major morbidity and mortality in Asia and Africa but rarely in the United States. We describe two patients bitten by the Asiatic cobra *Naja kaouthia* — both successfully treated in the emergency department. Patient 1 was a 23-year-old woman bitten in the buttock by her cobra. Examination demonstrated two puncture wounds. She developed cranial neuropathy, respiratory failure, and coagulopathy 10h later, necessitating endotracheal intubation and polyvalent antivenom administration. The patient recovered fully with minimal wound necrosis. Patient 2, a 44-year-old man, was bitten on the hand by his cobra. Examination revealed a puncture wound with progressive swelling. Edrophonium and monovalent antivenom were administered, and he recovered uneventfully. These cases emphasize the varied clinical presentations of the Asiatic cobra. Patient 1 developed delayed neurotoxicity, respiratory failure, and hematotoxicity with minimal wound necrosis, whereas Patient 2 experienced a more typical clinical course.

Emergency medicine in Lebanon: Overview and prospect

Jamil D. Bayram MD, MPH

The Journal of Emergency Medicine Volume 32, Issue 2, February 2007, Pages 217-222

Abstract

Emergency Medicine, established in the United States as a specialty in 1979 and in Canada in 1980, is drawing interest among countries throughout Europe, Asia, and the Middle East. Lebanon, located on the eastern coast of the Mediterranean Sea, like many other developing countries, struggles to advance its medical system. One of the main hurdles is the continuing violence and political turmoil. Attempts at health care system recovery have been met with a number of deep-seated structural problems. Data and references regarding emergency healthcare are rare. This article presents an overview of the current status of emergency medicine in Lebanon as well as ongoing related activities over the past decade and the plans for future development. Parts of this article have been presented by the author at the Second Mediterranean Emergency Medicine Congress in Sitges, Spain, September 16, 2003. This article is the result of an extensive literature search on health and emergency medicine in Lebanon. It presents an expanded analysis with a comprehensive bibliography. The author is emergency medicine trained at Stroger Hospital of Cook County (Chicago) and has had three years experience in Southern Lebanon as a Chairman of the emergency department at Hammoud Hospital from July 1999 to June 2002. International Emergency Medicine is coordinated by Jeffrey Arnold, md, of Tufts University School of Medicine and Baystate Medical Center, Springfield, Massachusetts.

Recombinant Activated Coagulation Factor VII and Bleeding Trauma Patients.

Rizoli, Sandro B. MD, PhD; Nascimento, Bartolomeu Jr MD; Osman, Fahima MD; Netto, Fernando Spencer MD, PhD; Kiss, Alex PhD; Callum, Jeannie MD; Brenneman, Frederick D. MD; Tremblay, Lorraine MD, PhD; Tien, Homer C. MD

Journal of Trauma-Injury Infection & Critical Care. 61(6):1419-1425, December 2006.

Abstract

Background: Recombinant activated coagulation factor VII (rFVIIa) is increasingly being administered to massively bleeding trauma patients. rFVIIa has been shown to correct coagulopathy and to decrease transfusion requirements. However, there is no conclusive evidence to suggest that rFVIIa improves the survival of these patients. The purpose of this study was to determine whether or not rFVIIa has an effect on the in-hospital survival of massively bleeding trauma patients. **Methods:** A retrospective cohort study was conducted from January 1, 2000 to January 31, 2005, at a Level I trauma center in Toronto, Canada. Inclusion criteria included trauma patients requiring transfusion of 8 or more units of packed red cells within the first 12 hours of admission. The primary exposure of interest was the administration of rFVIIa. Primary outcome was a 24-hour survival and secondary outcome was overall in-hospital survival. **Results:** There were 242 trauma patients identified who met inclusion criteria; 38 received rFVIIa. rFVIIa patients were younger, had more penetrating injuries, and fewer head injuries. However, rFVIIa patients required more red cell transfusions initially, and were more acidotic. Administering rFVIIa was associated with improved 24-hour survival, after adjusting for baseline demographics and injury factors. The odds ratio (OR) for survival was 3.4 (1.2-9.8). Furthermore, there was a strong trend toward increased overall in-hospital survival. The OR of in-hospital survival was 2.5 (0.8-7.6). Also, subgroup analysis of rFVIIa patients showed that 24-hour survivors required a slower initial rate of red cell transfusion (4.5 vs. 2.9 units/hr, $p = 0.002$), had higher platelet counts (175 vs. 121 [x10-9/L], $p = 0.05$) and smaller base deficits (7.1 vs. 14.3, $p = 0.001$) compared with rFVIIa patients who died during the first 24 hours. **Conclusion:** rFVIIa may be able to improve the early survival of massively bleeding trauma patients. However, surgical control of massive hemorrhage still has primacy, as rFVIIa did not appear efficacious if extremely high red cell transfusion rates were required. Also, correction of acidosis and thrombocytopenia may be important for rFVIIa efficacy. Prospective studies are required.

SORT(ING) Out the Casualties: The Special Operations Resuscitation Team in Afghanistan

Dr. Ken Finlayson
Previously published in *Veritas* Vol 5 No. 1 2009. Permission granted to republish in JSOM.

(L to R) SPC Donnell Smith, Marine Sergeant Archer, SPC Dwayne Bostic and Staff Sergeant Antujuan Brown unload a casualty from the UH-60 MEDEVAC helicopter in Farah, Afghanistan. The Special Operations Resuscitation Team (SORT) handled an average of two trauma cases a day.

Contact was made shortly after dawn on 26 June 2008 by the Marine Special Operations unit as it entered a narrow valley in far western Afghanistan. A routine reconnaissance patrol was ambushed. A fierce firefight resulted as the insurgents directed accurate small arms fire down from positions on the canyon walls. The American Marines and their Afghan allies dismounted to return fire. In the ensuing melee, one Marine was killed and six others were wounded. The two Navy corpsmen were among the casualties. A request for casualty evacuation to the Marine Special Operations (MARSOC) operations center at Farah triggered an immediate response. This action would validate the Special

(L to R) CPT Jamie Riesberg, an Afghan interpreter, a medic from the CJSOTF Civil Affairs Team, SSG Brian Moore, and CPT Ed Dunton attend a trauma patient. The X-ray machine used by the team is shown as is a "bear hugger" blanket that circulates warm air over a patient to stabilize his body temperature.

Map of Farah. The Province of Farah is in the western part of Afghanistan. The provincial capital, also called Farah, was the location of the SORT.

Operations Resuscitation Team (SORT) from the 528th Sustainment Brigade Special Operations.

Army Staff Sergeant (SSG) Michael R. Fulghum and Sergeant (SGT) Antujuan Brown, the two Special Operations Combat Medics (SOCMs) on the SORT, grabbed M-9 medical bags and ran out to board two UH-60 Black Hawk helicopters on the Forward Operating Base (FOB) helipad. "SGT Brown got on the MEDEVAC [medical evacuation] bird and I jumped on the chase bird [an armed UH-60] and we took off," said SSG Fulghum. "It was a twenty minute flight out there but we circled for an hour while the Marines tried to break contact and withdraw so we could get them."[1]

While close air support (CAS) aircraft dropped 500-pound bombs on the enemy positions, the Marines managed to break free from the ambush. The two Black Hawks alternately swooped down to pick up wounded Marines and Afghan soldiers; three casualties per helicopter. None of the casualties were on litters. To his horror, SSG Fulghum realized that one of his patients, a badly wounded Navy corpsmen, was a friend.

"'Tony' had been shot through the left side and had a gaping wound in his lower chest wall," said Fulghum. "His intestines were coming out and he was bleeding badly. It was chaos inside the aircraft. As the helicopter took off, two open bandages blew out the window. I got an IV in him and a dressing on the wound, but it was real bad."[2] As the two Black Hawks raced back to Farah, Fulghum checked the other two casualties.

"The Afghan was shot in the upper arm, but not too bad. The wounded Marine was hit in the upper thigh and had two tourniquets on his leg. He was still bleeding steadily so I put another tourniquet on above the others. It wasn't much help, but I had to get back to Tony. That fifteen minute flight seemed like an eternity," SSG Fulghum recalled.[3] When the helicopters touched down, the patients were off-loaded onto litters and rushed into the small FOB hospital. The helicopters took off to bring back three more casualties.

For the next thirty-six hours, SORT personnel worked nonstop to stabilize the nine casualties sufficiently to evacuate them to the Army combat support hospital at Bagram. Everyone survived. The lifesaving that took place on 26 June 2008 validated the SORT concept for Army SOF as well as the team's pre-mission training. This article will explain the mission preparation and how the SORT supported the Combined Joint Special Operations Task Force-Afghanistan (CJSOTF-A).

The SORT was created by the 528th Sustainment Brigade, Special Operations (Airborne) (Provisional) at Fort Bragg, North Carolina, to provide the stabilization and evacuation of casualties in Army Special Operations Forces (ARSOF) units and to reduce the patient administrative burden on unit medics. ARSOF needed a small, highly responsive lifesaving/life preserving medical organization that was leaner and more agile than that provided by the U.S. Army Medical Corps. Normally an 80-man area support medical company (ASMC), operating a small field hospital has this responsibility. The ASMC has a 40-bed holding capacity, provides ground ambulance evacuation, laboratory, X-ray, dental, and patient administration services for a corps area.[4] An eight-man SORT reinforced by a small surgical team and

SSG Antujuan Brown, one of two Special Operations Combat Medics (SOCMs) on the SORT, treats a young Afghan girl at the weekly medical clinic. The SORT ran a clinic for the local population twice a week and treated as many as a thousand patients a week.

Specialist Ronnie M. Heflin build shelves for the medical supply room at the hospital. The SORT laboratory technician, Heflin applied his carpentry skills to improve the "bare bones" facility.

dedicated air evacuation capability, was designed to provide advanced trauma management (ATM) to ARSOF units in remote field locations. This was the mission to be validated by the first SORT deployed by the 528th.[5]

Captain (CPT) Jamie C. Riesberg, MD, the physician on the team, was an original member of the organization. After finishing his residency in family medicine at Womack Army Hospital, Fort Bragg in 2006, he was assigned to the battalion surgeon's office of the 528th Support Battalion. "The SORT grew out of the Special Operations Medical Association Conference in Tampa in 2007," said Riesberg. "The problem was how to provide Role II (second echelon, resuscitation and stabilization) medical support to ARSOF. The Army medical organization had too big a footprint. LTC Lorykay Wheeler, the 528th surgeon, built the capability that became the SORT."[6] The team structure reflected their mission of managing trauma on the battlefield.

"Based on our first OIF experience in 2003, it was clear that the SOSCOM (Special Operations Support Command) was not able to provide the second echelon of medical support that the ARSOF units needed when they first entered theater," said LTC Lorykay W. Wheeler. "ARSOF has always depended upon conventional Army medical units to provide the Role II medical care. When we went to Iraq in 2003, the medical units that were programmed to support us took quite a while to flow in. Eventually a Forward Surgical Team (FST) showed up, but we needed their capability at the beginning."[7] After her tour in Iraq, LTC Wheeler worked with the surgeons of U.S. Army Special Operations Command (USASOC) and United States Special Operations Command (USSOCOM) to create a small, deployable organization that would fill the gap between the ARSOF team medics (Role I) and the U.S. Army Medical Corps Role II medical support.

"The SORT was originally created as an expeditionary, short-term fix until the theater medical assets were established," said Wheeler. "It was designed to operate in an austere environment like we have in Afghanistan, where the coverage is difficult to provide due to the great distances and lack of Role II facilities."[8] The SORT concept survived the ARSOF logistical support reorganization that eliminated the 528th Special Operations Support Battalion.

"In putting together the Modified Table of Organization and Equipment (MTO&E), we had to take into account that the Special Forces physician's assistants (PA) and medical teams had gone to the Special Forces Group Support Battalions (GSBs) when the 528th Battalion was disbanded in 2005," said CPT Riesberg. "By MTO&E, the SORT had a physician with emergency room or family medicine training, a registered nurse (RN) with emergency medicine or critical care experience, two SOCMs, a licensed practical nurse (LPN), one X-ray technician, one laboratory technician, and one patient administration specialist. A PA from the GSB was optional."[9] The team did not have all these personnel for the 2008 Afghanistan mission.

The SORT supported the 7th Special Forces Group (SFG) from April to December 2008. The 7th SFG staff formed the nucleus of Combined Joint Special Operations Task Force-Afghanistan (CJSOTF-A), which controlled Coalition Special Operations Forces throughout the country. It was a multi-national and multi-service organization. The 7th SFG surgeon, Lieutenant Colonel (LTC) Andrew L. Landers, was dual-hatted as the CJSOTF surgeon.

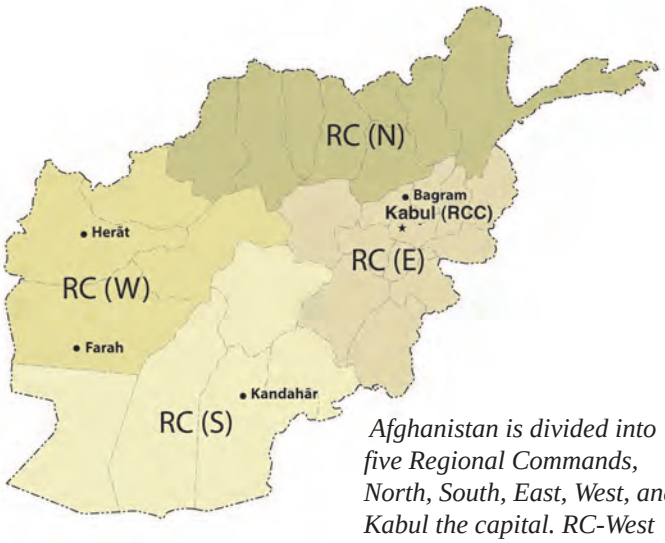
"I requested the SORT because we needed a scaled-down package to provide their Role II (medical and surgical) capability in Farah," said Landers. "The operating environment there was austere and the distances for evacuation were long."[10] Farah was a four-hour flight to Bagram on the other side of the country. "The SORT gave us an agile capability that we could move as necessary, said LTC Landers. "They provided the ability to stabilize casualties and, if necessary, their people could accompany the patient during the evacuation to the next level of care. They did that several times."[11] The initial SORT mission was to support the Marine Special Operations Command (MARSOC) forces in Farah, in extreme western Afghanistan. Having been alerted for deployment, the team conducted an intensive pre-mission training program.

Riesberg was the team physician. CPT E. Edward Dunton, RN, was the SORT Team Leader. SSG Brian P. Moore, one of two X-ray technicians, served as the Team Sergeant. SSG Michael R. Fulghum and SGT Antujuan Brown were the two SOCMs. Specialists (SPC) Donnell B. Smith, an X-ray technician, Ronnie M. Heflin, a laboratory technician, and Dwayne A. Bostic, a patient administration specialist, rounded out the team. There would be no PA or LPN. Cross-training provided medical specialty redundancy. The team trained to cover their requirements for communications, supply, and maintenance. Surgical support was to come from in-country Army medical assets.

An ISU-90 container. The SORT was designed so that all its equipment could be loaded into three of these units for shipment on Air Force cargo aircraft.

"We had to make sure everyone was cross-trained," said SSG Brian P. Moore. "We were starting from a blank slate. We had to do weapons qualification, survival training, and our military occupation specialty (MOS) training to get ready. We had about a month and a half when we got the word for the deployment."[12] After one false alarm, the team got the deployment orders in February 2008.

"Originally 3rd SFG requested us for Afghanistan in October 2007," said CPT Ed Dunton. "That got turned off in February 2008. The 7th SFG requested us when they took over the CJSOTF mission from 3rd SFG. When we first got the word that we were going with the 7th, we did not have an exact (operational) location. Consequently we loaded all our tentage, water purification systems, generators, and everything in three ISU-90 containers."[13] The SORT left Pope Air Force Base with all its equipment on 21 April 2008 aboard a



Afghanistan is divided into five Regional Commands, North, South, East, West, and Kabul the capital. RC-West was under Italian and Spanish control.

(R to L) CPT Jamie Riesberg and Dr. Moreno from the Italian Coalition forces prepare to load a casualty from the Provincial Reconstruction Team's MRAP (Mine Resistant Ambush Protected) ambulance onto a U.S. Air Force C-130 Hercules for evacuation to Bagram. At left, the Air Force crew chief looks on.

The operating room. A U.S. Army Reserve surgical team from Task Force Med provided the emergency surgical capability that the SORT did not have.

The provincial capital, Farah is a city of 40,000. The SORT compound was located outside of the city. The SORT stayed with the Marine Special Operations teams. The Marines named their compound Fire Base Heredia in honor of a Marine killed in the 26 June 2008 ambush.

C-17 Globemaster III. After stopping briefly to refuel at Spangdahlem Air Base in Germany, they arrived at Bagram, Afghanistan, on 22 April.

The SORT remained at Camp Vance, in Bagram for ten days. During that time they secured additional supplies and coordinated procedures with the theater hospital for the reception of patients. The 3rd SFG handed off the CJSOTF mission to the 7th on 1 June 2008. The CJSOTF surgeon, LTC Andrew L. Landers, wanted the SORT to coveroperations in RC-West.

"I was able to meet with the team prior to their deployment," said LTC Landers. "I told them their goal was to ensure that anyone who was alive when they were received by the SORT would remain alive as long as they were under the team's control and were handed off to the next higher level of medical care."[14] Landers reminded the team not to forget their primary mission.

"His guidance to me was pretty straight forward," said CPT Ed Dunton. "Do not degrade your capability."[15] The mission for the SORT was to support the MARSOC element and all coalition units operating in Regional Command-West (RC-West). A city of roughly 40,000 inhabitants, Farah was the primary urban center in the region. An Afghan district hospital was there.

Less than a mile out of Farah, the team found three small, closely spaced compounds. There was an airfield that could handle large transport aircraft. The compounds and the airfield were enclosed by a concertina wire perimeter fence. Adjoining the MARSOC compound was a second base used by the Afghan National Army (ANA).

Sponsored by the various Coalition nations, the American Provincial Reconstruction Team (PRT) is a multi-service organization with military and civilian personnel. Their mission is to facilitate humanitarian relief and reconstruction.[17] Among the personnel in the PRT was a medical team of U.S. Navy Reservists with two physicians, a PA, a laboratory technician, and two corpsmen. The PRT base also housed the surgical team from Task Force-Med (TF-Med) from the U.S. Army Theater Medical Organization. The TF-Med team had been in Farah for six months. The team was made up of U.S. Army Reserve personnel and had a general surgeon, a nurse-anesthetist, two operating room technicians, an intensive care nurse, an LPN, and two medics. They provided the surgery capability the SORT did not have.[18] Now three medical teams would operate out of the ten-room hospital on the PRT compound.

The medical facilities, while better than expected, were quite small and austere by U.S. standards. The largest room in the hospital was the four-bed trauma ward for incoming patients. There was an operating room, a pair of intensive care holding areas for patients coming out of surgery with two beds, and an intermediate holding area with two beds for stabilized patients awaiting evacuation. The hospital had a pharmacy, a central supply room that doubled as the area for sterilizing the surgical equipment, a small laboratory, a room where the SORT set up their communications equipment, and a break room.[19] The air-conditioned building had a dedicated generator and an emergency back-up system. Space was at a premium so the SORT medical supplies were stored in 40-foot MILVAN containers. With three different medical teams using the same facility, a mutually acceptable routine and standard operating procedures (SOPs) had to be established.

"Initially we had three chains of command," said CPT Ed Dunton. "Our mission was trauma. The PRT medical personnel took care of their routine sick call as well as for

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The SORT trauma ward. Patients were brought here initially for resuscitation and stabilization. The SORT could run up to four trauma beds simultaneously in this ward.

(L to R) CPT Patrick McGraw, surgeon of the TF-Med team performs an operation on a patient. CPT Ed Dunton and an Afghani doctor from the district hospital assist. Local medical personnel received training from the U.S. personnel at the hospital.

locals and the TF-Med guys did surgery."[20] To reduce confusion in the trauma ward, the SORT demonstrated their well-practiced system. "At first, the guys had different ways of setting up the equipment for each bed," said SSG Brain Moore. "I set up one bed the way we do it, with everything in a certain spot. The other teams agreed it was a good method and we set up all four that way."[21] That done, the SORT quickly fell into a daily routine; one that kept every member professionally busy in their specialty and with their additional duties.

SPC Donnell B. Smith was the primary X-ray technician on the team because SSG Moore filled the role of Team Sergeant and LPN. "Every patient we received had a chest X-ray, as a minimum. If the doctors needed other shots, I took them there at bedside," said Smith. "My system is portable. I roll it up to the bedside and shoot it there. The X-ray is digital and can be read on my laptop. I store each patient in a separate computer file and the doctors can call up who they want to see."[22] If more than one patient arrived at once, the small trauma ward got very busy.

Trauma cases require that several actions occur simultaneously. "When we get more than one patient at a time, it gets pretty hectic around the beds. I have to get the patient information from the medics as they are working, fit my X-ray system in there, and get my shots. It can be like one of those automatic carwashes, just moving along," said SPC Smith.[23] The mission of the SORT was to stabilize the patients and evacuate them to the next higher level of medical care as quickly as possible. Initiating the evacuation request was the responsibility of SPC Dwayne A. Bostic, the SORT patient administrator.

"My key role was tracking the patients, collecting all their personal and medical information, and getting a file going on each one," said Bostic. "My computer system is called Medical Communications for Combat Casualty Care (MC-4) and it collects all the patient's vital information as I input it. This record follows the patient."[24] Once the doctor determined that

The supply room in the hospital was shared by all three medical teams. Most of the SORT medical supplies were kept in MILVANs next to the hospital.

the patient was sufficiently stable for evacuation, Bostic coordinated the pick-up.

"I would call the guys in Bagram that handled the evacuations at the combat support hospital. Getting a flight could sometimes be a real hassle," said Bostic.[25] Because medical evacuation flights were a coalition effort, in RC-West, the primary responsibility lay with the Italian and Spanish forces in charge in the region. "The Italians and Spanish had a four-hour launch time and they didn't fly at night or in low visibility," said CPT Ed Dunton. "If we could, we tried to get Air Force or Marine C-130s. Their response time was quicker."[26]

"If we couldn't get an Air Force aircraft, we could sometimes get the British in RC-South to take patients to their hospital," said CPT Jamie Riesberg. Not all the patents went

The UH-60 Black Hawk MEDEVAC helicopter preparing to take off on the pad on the PRT compound. Two black Hawks from Task Force-101 were stationed at Farah. One of the SORT medics rode on each bird on every flight.

U.S. Air Force surgeon Maj Clifford Perez checks a patient's vital signs at Craig Theater Hospital in Bagram. The state-of-the-art facility was the usual destination for trauma patients treated by the SORT.

An Afghan boy brought in with a severe head wound in the intensive care ward of the hospital. He is on a ventilator and his vital signs are being monitored electronically. The SORT would arrange for the evacuation of locals to the Red Cross hospital in Kabul or on occasion, the U.S. theater hospital in Bagram.

directly to Bagram. "In some cases, we would fly the patient directly to the U.S. Army Hospital at Landstuhl'. In 18 to 20 hours he could be in Germany, said Riesberg.[27] The SORT was responsible for the patient from his initial battlefield evacuation until he was passed to the next level of medical care.

"LTC Landers required that there be a SORT medic on each of the MEDEVAC birds," said CPT Dunton. "This meant that the two SOCMs (Fulghum and Brown), Dr. Riesberg, or myself were involved in every MEDEVAC mission."[28] SORT personnel were well-qualified for this mission. "Both of the SOCMs were trained as flight medics at Fort Rucker, Alabama. CPT Dunton was a qualified flight nurse, and I was the flight surgeon for TF-101 flight crews," said CPT Riesberg. [29] As the deployment unfolded, the well-trained SORT members assumed additional duties and responsibilities.

"After the 26 June ambush, we began sending one of the SOCMs with every MARSOC operation," said CPT Ed Dunton. "We lived and worked with those guys and there was a lot of trust built up that served us well in supporting their operations."[30] SORT members also supported the PRT operations when requested. "I went along on a medical civil action program (MEDCAP)," said SSG Brain P. Moore.[31]

SPC Donnell Smith working at the weekly medical clinic. An X-ray technician by MOS, Smith and the other SORT personnel were cross-trained to perform as medics.

"I went out several times with the Civil Affairs (CA) guys on missions," said SPC Smith. "I was a driver and a gunner on one of the vehicles, depending on what they needed."[32] To SSG Moore, this was all part of the SORT mission. "If the teams asked and we could help, we did. Little things can mean a lot. When the MARSOC patrols came back, our guys would bring Gatorade and water out to them as soon as they hit the gate."[33] The SORT did more than help the Coalition Forces. They sponsored a free medical clinic for the local Afghans twice a week.

On Tuesday and Thursday, select members saw patients from the local villages. "We had an interpreter contracted by the PRT," said SSG Michael Fulghum. "We called him 'Dutch'. His English wasn't that great, but he was willing. We ran an immunization program. We probably saw as many as a thousand people a week."[34] The team's emphasis on cross-training paid off during these missions.

SPC Dwayne Bostic, the patient administrator cross-trained as a medic, set up triage area during the sick call. "It was little rough at first," he said. "I would get the basic data, name, age, gender, and try to get a feel for the patient's problem. In the beginning, I sent everything to the doctors. As I got more confident, I could take care of most of the basic problems right then. A lot of the ailments were fixed with aspirin and cough syrup."[35] With the trauma mission and the increasing support to the locals, replacing the medical supplies was a constant problem. Their location in Farah made resupply from the distribution center in Bagram difficult.

SPC Donnell Smith when not taking X-rays, ordered supplies. "We have a system called a computerized logistical program (D-Cams) for ordering supplies. CPT Dunton would figure out what we needed and I'd work up the order. The request would go up to the CJSOTF medical logistics planner who would get the stuff from the medical company at Bagram and send it to us," said Smith. "Getting the stuff by air was the preferred method. If it was sent by 'Ginga truck' we might never see it."[36] The SORT also did most of the ordering of supplies for the TF-Med team.

CPT Clayton C. Langdon, the medical logistics planner for the 528th Sustainment Brigade commented, "The team deployed with a 30-day supply. This included blood and plasma products. Afghanistan is a different theater from Iraq; it is much more austere. Oftentimes it was easier, especially early in the deployment, for the team to call back to us and we would send their requests directly from Fort Bragg. One of the things we learned was that we needed was a medical logistician on the team. That guy could be at Bagram taking care of the SORT;[37] Despite a less than reliable supply system and at times a makeshift evacuation capability, the SORT for CJSOTF-Afghanistan demonstrated the validity of the concept.

"It all came together on 26 June. The first Marine we saw walked in with a bullet literally sticking out of his head. A round had hit his NVG [night vision goggles] helmet bracket,

Marines on patrol in a village in Farah Province. The SORT provided medical coverage to the Marine Special Operations teams after their corpsmen were wounded in the 26 June ambush.

In September the sole rocket attack on the Coalition compound occurred. One rocket struck the hospital. The attack occurred on a Friday and the damage was repaired by the following Tuesday.

split, and stuck in his skull," said CPT Dunton. "When they brought the corpsman in, we were looking at what we call a 'circle in the drain' patient. He was literally 'spiraling down' and going fast. With him and the others, we were in a true mass casualty situation. Everyone worked all out and we had everyone stabilized pretty well inside of five hours. Except for the corpsmen, they were all evacuated in 18 hours (the corpsmen was evacuated after 36 hours.) That one event justified all the training and preparation."[38] Not only did the SORT save and preserve lives of those injured on the battlefield; it reduced the administrative load on the ARSOF Team medics.

"One of the biggest things the SORT does is free up the Special Operations medic to remain with his team," said CPT Jamie Riesberg. "Before we came on the scene, the medic had to stay on the patient. It takes up to eight man-hours to do the coordination and record keeping to move a patient through the system. The ARSOF team medic was responsible for this, taking him away from his team. Now we take the patient off his hands well forward and streamline the system."[39]

The Special Operations Resuscitation Team served in Farah from May until December 2008. The team averaged one to two trauma casualties a day from the RC-West units: the U.S. Army and Marines, ANA, Afghan National Police, and local civilians. Their greatest "surge" was handling 17 trauma patients in 18 hours. During its first employment in combat, the team demonstrated their value added to CJSOTF-Afghanistan. LTC Andrew Landers credited their success to "having the right people. It doesn't just happen. They had the right combination of skills and motivation to do the job."[40]

The author would like to thank the 528th Sustainment Brigade SORT members for the time and photographs that made this article possible.

Endnotes

1. Michael R. Fulghum, 528th Sustainment Brigade, Special Operations, interview by Dr. Kenneth Finlayson, 5 February 2009, Fort Bragg, NC, digital interview, USASOC History Office Classified Files, Fort Bragg, NC. Special Operations Combat Medics (SOCMs) are highly trained combat medics who have completed the first half of the year-long Special Forces Medic. They are expert in the treatment of combat casualties.
2. Fulghum interview, 5 February 2009.
3. Fulghum interview, 5 February 2009.
4. Field Manual 4-02.24, *Area Medical Support Battalion, Tactics, Techniques and Procedures* (Washington DC: Headquarters Department of the Army, 2000) 3-1 to 3-7.
5. The earliest antecedents of the SORT were developed and deployed in 2004 and 2005 by the Joint Special Operations Command. A pruning process eliminated the dental and veterinary capability and resulted in the present SORT configuration. Fulghum interview, 5 February 2009.
6. Jamie C. Riesberg, 528th Sustainment Brigade, Special Operations, interview by Dr. Kenneth Finlayson, 14 January 2009, Fort Bragg, NC, digital interview, USASOC History Office Classified Files, Fort Bragg, NC; Jamie C. Riesberg, MD, "The Special Operations Resuscitation Team (SORT): Robust role II Medical Support for Today's SOF Environment," *Journal of Special Operations Medicine*, Vol. 9, Edition 1, Winter 2009.
7. Lorykay W. Wheeler, U.S. Army John F. Kennedy Special Warfare Center and School, interview by Dr. Kenneth Finlayson, 9 February 2009, Fort Bragg, NC, interview notes, USASOC History Office Classified Files, Fort Bragg, NC.
8. Wheeler interview, 9 February 2009.
9. Riesberg interview, 14 January 2009.
10. Andrew L. Landers, 7th Special Forces Group, interview by Dr. Kenneth Finlayson, 10 February 2009, Fort Bragg, NC, digital interview, USASOC History Office Classified Files, Fort Bragg, NC.
11. Landers interview, 10 February 2009.
12. Brian P. Moore, 528th Sustainment Brigade, Special Operations, interview by Dr. Kenneth Finlayson, 4 February 2009, Fort Bragg, NC, digital interview, USASOC History Office Classified Files, Fort Bragg, NC.
13. E. Edward Dunton, II., 528th Sustainment Brigade, Special Operations, interview by Dr. Kenneth Finlayson, 4 February 2009, Fort Bragg, NC, digital interview, USASOC History Office Classified Files, Fort Bragg, NC. The ISU-90 is a metal cargo container commonly used to ship unit equipment. It is 90" high x 88" wide x104" long.
14. Landers interview, 10 February 2009.
15. Dunton interview, 4 February 2009.
16. E. Edward Dunton, II., 528th Sustainment Brigade, Special Operations, interview by Dr. Kenneth Finlayson, 9 February 2009, Fort Bragg, NC, digital interview, USASOC History Office Classified Files, Fort Bragg, NC.
17. Michael J. Dziedzic and Colonel Michael K. Seidl, United States Institute of Peace, Special Report 147, "Provincial Reconstruction Teams: Military Relations with International and Nongovernmental Organizations in Afghanistan," August 2005, copy in USASOC His tory Office Classified Files, Fort Bragg, NC.
18. Task Force Med (TF-Med) was the Army Theater medical support organization. Headquartered at Bagram, it was comprised of the 396th Combat Support Hospital and the 550th Area Medical Support Company. These units staffed Craig Theater Hospital in Bagram and provided Area Medical Support to Coalition units throughout Afghanistan.
19. Dunton interview, 9 February 2009. The SORT communications packaged consisted of a regular telephone, a satellite telephone, and secure and unsecure computer networks. Most of the communications with the CJSOTF was done with the MIRC, Military Instant Relay Chat internet system. Operational information had to be obtained from the MARSOC Tactical Operations Center.
20. Dunton interview, 4 February 2009.
21. Moore interview, 4 February 2009.
22. Donnell B. Smith, 528th Sustainment Brigade, Special Operations, interview by Dr. Kenneth Finlayson, 4 February 2009, Fort Bragg, NC, digital interview, USASOC History Office Classified Files, Fort Bragg, NC.
23. Smith interview, 4 February 2009.
24. Dwayne A. Bostic, 528th Sustainment Brigade, Special Operations, interview by Dr. Kenneth Finlayson, 4 February 2009, Fort Bragg, NC, digital interview, USASOC History Office Classified Files, Fort Bragg, NC.
25. Bostic interview, 4 February 2009.
26. Dunton interview, 4 February 2009.
27. Riesberg interview, 14 January 2009.
28. Dunton interview, 4 February 2009.
29. Riesberg interview, 14 January 2009.
30. Dunton interview, 4 February 2009.
31. Moore interview, 4 February 2009.
32. Smith interview, 4 February 2009.
33. Moore interview, 4 February 2009.
34. Fulghum interview, 5 February 2009.
35. Bostic interview, 4 February 2009.
36. Smith interview, 4 February 2009.
37. Clayton C. Langdon, 528th Sustainment Brigade, Special Operations, interview by Dr. Kenneth Finlayson, 5 February 2009, Fort Bragg, NC, digital interview, USASOC History Office Classified Files, Fort Bragg, NC.
38. Dunton interview, 4 February 2009.
39. Riesberg interview, 14 January 2009.
40. Landers interview, 10 February 2009.

A member of the Civil Affairs team watches as the UH-60 MEDEVAC bird prepares to touch down with patients for the SORT.

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Baseline Dissociation and Prospective Success in Special Forces Assessment and Selection

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Abstract

Introduction: Although dissociation at the time of trauma (peritraumatic dissociation) has been shown to predict the development of posttraumatic stress disorder (PTSD), it is not yet known whether the tendency to dissociate under nonstressful circumstances (i.e., at baseline) can also serve as a predictor of vulnerability to stress in healthy individuals. **Method:** Baseline symptoms of dissociation (CADSS) were assessed in 774 active duty male Soldiers enrolled in Special Forces Assessment and Selection (SFAS). **Results:** Soldiers who endorsed experiencing any symptoms of dissociation at baseline were significantly less likely to be successful in SFAS. The greater the number of symptoms of dissociation endorsed at baseline, the greater the likelihood of failure. **Discussion:** These data explain our earlier findings of fewer symptoms of dissociation in elite troops and may have relevance for the selection and hiring of personnel for nonmilitary, at-risk professions. Better screening may lead to improved primary intervention strategies, better job placement, and lowered risk of PTSD.

Introduction

In a recent investigation, we prospectively assessed the degree to which healthy, active duty Soldiers would experience symptoms of dissociation before and in response to acute, uncontrollable stress.[1] The results of the study provided robust evidence that 1) stress-induced symptoms of dissociation are extremely common in healthy humans; 2) individuals who endorsed greater symptoms of dissociation at baseline exhibited greater symptoms of dissociation under stress; and 3) members of Special Forces troops exhibited fewer stress-induced symptoms of dissociation than general troops.

Multiple risk factors for the development of trauma-related psychopathology have been identified in the scientific literature. One of the most replicated risk factors for the development of trauma-related psychopathology is peritraumatic dissociation (i.e., dissociation at the time of exposure to a traumatic event).[2–11] Although peritraumatic dissociation may be useful in predicting PTSD in individuals who have already been traumatized, it is not yet known whether the tendency to dissociate under nonstressful circumstances (at baseline) can also serve as a predictor of vulnerability to stress in healthy individuals.

In our previous studies of military personnel, individuals endorsing baseline symptoms of dissociation were at greatest risk for stress-induced symptoms of dissociation and stress-induced cognitive deficits, which in turn were associated with poor military performance.[1,12,13] However, we are aware of no studies that have measured the relationship between baseline (nonstress) dissociation and overall performance under conditions of high stress such as SFAS training. In this study, we hypothesized that individuals who endorsed baseline symptoms of dissociation would be less likely to tolerate the stress of Special Forces Assessment and Selection (SFAS) and would be more likely to fail. Predicting stress vulnerability would be of great relevance to job selection for high stress professions and may be useful in the development of primary prevention strategies targeting trauma-related psychopathology.

Methods

Prior to beginning the course, SFAS candidates provided written informed consent to participate in this study. Due to fact that the military personnel were active duty and being recruited to participate in a research study while enrolled in an official selection and assessment program, our research team took a number of precautions in order to ensure that subjects would not experience undue pressure to participate in the research study. First, and in keeping with the guidelines and recommendations of the Human Studies Committee (VA Connecticut), the research team took pains to ensure that Soldiers would be able to make free and informed decisions about participation in the study. In order to reduce any element of coercion, all subjects were recruited by a member of the research team who was explicit in the following information: 1) the recruiter/researcher was a civilian and not in the service of the U.S. Army. In addition, the researcher indicated that he was not receiving any money from the SFAS program; 2) participation in the research would in no way affect a candidate's status (positively or negatively) in SFAS. The researcher further explained that information about enrollment and information provided by enrollees on the questionnaire would be kept confidential and not shared with anyone apart from the research team. Potential participants were also explicitly told that no information would be given to the SFAS personnel; 3) the research project was designed to help scientists evaluate and understand psychological,

biological, and physiological aspects of why individuals differ in their performance under stress.

The principal investigator (CAM) then gave an oral description of the study (i.e., described what would be required of them if they agreed to participate) after which consent forms were passed out to all potential participants. The principal investigator read through each section of the consent form aloud to the potential participants. After this was completed, all were given time to review the consent forms if they chose to do so. The consent forms provided a description of the study and explicitly indicated that the purpose of the National Center for PTSD study was to evaluate psychological, biological, and physiological aspects of military training stress in an effort to better understand how and why individuals differ in stress tolerance. This information was included in the consent form. Soldiers were not told that we were trying to predict who would fail in SFAS.

Finally, all the candidates recruited for this study were on active duty status and therefore were not allowed by the command to accept payment for their participation in the study. All were informed of this fact and told that the only benefit they would receive for participating in the study was the knowledge that their participation in the research may help advance medical science about stress hardiness and stress vulnerability. All were told once more that they were free to refuse participation and that the refusal to participate would not affect their status (positively or negatively) in SFAS. Of the 794 SFAS candidates who were given the study recruitment speech, 774 candidates enrolled in the study. Thus, the refusal rate was three percent. Information on the 20 individuals who refused to participate in the study was not available to the research team.

***Participants*:** Of the 794 candidates approached, 774 (97%) active duty male Soldiers (mean age 26, SD=4) agreed to participate in the study. All participants were enrolled in a U.S. Army SFAS program. The participants' mean years of service in the Army was 4.9 (SD=3.2). Two-hundred eighty Soldiers (36%) were married, 403 (52%) Soldiers were single, and 86 (11%) Soldiers were divorced. Eighty-six percent or 677 candidates were enlisted and 110 (14%) were officers.

***Procedure*:** After providing informed consent, participants completed the self-report portion of the Clinician Administered Dissociative Symptom Scale (CADSS). The CADSS is a reliable, valid, self-report instrument designed to assess state symptoms of dissociation in response to a specified stressor.[14] Subjects were instructed to complete the CADSS using the week previous to enrollment in the course as their reference point. Subjects were instructed to inform the research team (orally and in writing) if during the previous week they had experienced any traumatic or highly stressful events. We did not include the clinician-observer component of the CADSS given the low intercorrelation coefficients for this component. After completing the CADSS, participants commenced participation in SFAS.

***Data analysis*:** In order to test the hypothesis that symptoms of dissociation would be significantly related to success or failure in SFAS, the following variables were created: total CADSS scores (the sum of individual CADSS items); classification scores indicating whether or not subjects reported symptoms of dissociation at baseline (1=yes; 0=no); and two additional classification scores designed to classify subjects in a binary fashion based on whether or not their CADSS total score was greater than, at, or below a specified value (less than 5; equal to, or greater than, 5; less than 11; equal to or greater than 11). These classification cut-off points were selected based on the distribution of responses from subjects in this study and on the mean pre-stress CADSS dissociation scores noted in our previous studies.[15] Chi-squared analyses were performed to test whether subjects endorsing baseline symptoms of dissociation (any, greater than 5 points, greater than 11 points) were more likely to fail SFAS compared to peers who did not report such symptoms.

***Receiver operator characteristics (ROC) curves*:** ROC curves were created by using the CADSS baseline total score (the test variable) in order to predict outcome in the SFAS program (the state variable, where 1= failed SFAS). ROC graphs were created for the group as a whole and for the sub-group of subjects whose CADSS score was 1 or greater. For both ROC graphs, the area under the curve as well as coordinate points for the curve were calculated (SPSS 11.5). The null hypothesis assumption was that the true area under the curve equals 0.5. With regard to the parameters for the standard distribution of error, the distribution assumption was nonparametric and the confidence interval 95 percent.[16] Although this method is also a regression model, it offers an advantage over the logistic regression format in that a classification table corresponding to specific scores on the CADSS and to the likelihood of success or failure in the course is possible.

Results

Of the 774 who participated in the study and in SFAS, 318 successfully passed the course; 456 candidates did not. The mean CADSS score at baseline was 2.39 (SD=4.5; range=44). The distribution was not normal (skewness 3.30). Of the 774 subjects, 425 subjects (55.0%) did not endorse any symptoms of dissociation at baseline; 349 subjects (45.0%) endorsed such symptoms. As shown in Tables 1, 2, and 3, the pass rates in SFAS were significantly different between the group of candidates who reported dissociation and those who did not (Score of 1 or greater on the CADSS versus CADSS score of zero: Chi-Square=4.5; df=1; asymptotic significance [asymp. sig.] (2-sided) $p<0.035$; Fisher's Exact Test, Exact Significance: $p<0.04$ (2-sided); $p<0.021$ (1-sided); Score of five or more on the CADSS versus a score of less than 5 on the CADSS: Chi-Square=9.3; df=1; asymp. sig. (2-sided) $p<0.002$; Fisher's Exact Test, Exact Significance: $p<0.002$ (2-sided); $p<0.001$ (1-sided); Score of 11 or more on the CADSS versus a score of less than 11: Chi-Square=10.7; df=1; asymp. sig. (2-sided) $p<0.001$;

Fisher's Exact Test, Exact Significance: $p<0.001$ (2-sided); $p<0.001$ (1-sided).

***ROC curve data*:** When an ROC curve is created, the area may take values between 1 and zero. A value of 1 or zero would indicate that the test is always right or always wrong, respectively. If the test performs no better than chance at detecting the state variable (for example, failure in SFAS), the area under the curve would be 0.5. Using the variable "total dissociation score" as the "test variable" and "status" as the "state variable" (value of the state variable=failure in SFAS), ROC analyses indicated that the area under the curve was 0.6 (nonparametric standard of error=0.021); $p<0.01$. Thus, the total dissociation score performed better than chance at predicting likelihood of failure at SFAS.

Table 4 lists the coordinate points of the ROC analysis and indicates, for a given score on the CADSS, the probability of being right (sensitivity) or of being wrong (1 minus the specificity) in predicting whether a subject who endorsed any particular score on the CADSS would fail the SFAS course. As noted in Table 4, the probability of being wrong in predicting that a candidate who obtains a particular dissociation score on the CADSS can be calculated. For example, using these signal detection methods, the likelihood of being wrong in predicting that a candidate obtaining a score of 5 or more on the CADSS will fail SFAS is approximately 9.0 percent; similarly, the probability of error in predicting that a candidate who obtains a score of 11 or greater on the CADSS will fail SFAS is less than 2.0.

Discussion

Soldiers who endorsed experiencing any symptoms of dissociation on the CADSS at baseline were significantly less likely to be successful in Special Forces Assessment and Selection (SFAS). Indeed, the greater the number of symptoms of dissociation endorsed at baseline, the greater the likelihood of failure in the course. Fewer than nine in 100 candidates who had a baseline CADSS score of greater than 5 and fewer than two in 100 with a score greater than 11 (maximum score of 79 possible) passed the course. Thus, tendency to dissociate at baseline served as a significant predictor of military training performance under highly demanding and stressful conditions. These data may help to explain our earlier finding that elite Special Forces troops exhibited fewer stress-induced symptoms of dissociation than general troops during high-intensity training. It appears likely that the SFAS process "weeds out" Soldiers who tend to dissociate and selects those who do not tend to dissociate. That said, it is important to underscore the fact that we were not able to assess other life experiences in this particular sample (for example, history of traumatic stress exposure). It is possible that this or other variables contributed to the present findings. In the future, we anticipate having permission from the military to assess other variables of interest.

With the increased operational tempo of Special Operations units in support of the Global War on Terror, U.S. military leaders continue to look for ways to maximize throughput of SFAS programs. With student attrition a primary concern, directors of SFAS programs are faced with the choice of lessening requirements, introducing remedial interventions for poor performers, or improving candidate selection protocols. Many believe that lowering the criteria for successful completion of such programs would be imprudent. However, assessment of candidates for baseline dissociation could help to identify those who may benefit from remedial efforts or be better suited for other military occupations. Screening out candidates who are unlikely to succeed would better focus training resources on candidates more likely to successfully complete the course. Signal detection methods may significantly assist in decision-making. Although they do not replace the decision-making capacity of professionals, signal detection methods provide professions information about the probability that they will err in the predictions they make. Clearly the accuracy of such methods is directly related to the degree to which valid, normative databases for populations of interest have been established.

The present study has several limitations. First, the CADSS data are self-report data and we currently do not know whether they reflect a unique factor or a more generic "first factor." Although the subjective data was predictive of future success, if these data were actually used in selection programs, potential candidates knowledgeable about this relationship might cease to report such information. Future studies are underway to clarify this issue and to assess whether the propensity to dissociation may be more objectively assessed prior to stress exposure.

A second limitation is related to the study population. The present study was limited to U.S. military personnel. To our knowledge, the relationship between propensity to dissociation and success in selection programs for civilian professions exposed to high stress (such as search and rescue, law enforcement, or firefighting) have not yet been conducted. Thus, at present we do not know whether the findings have relevance to non-military professions. However, within the context of the current war, improved screening for military occupations may result in the identification of candidates who are at greater risk for stress-related difficulties; this capability might one day lead to improved primary intervention strategies or to better military job placement decisions.[17,18]

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TABLE 1. Increased dissociation is associated with increased likelihood of failure: any symptom endorsement

	Fail SFAS	Pass SFAS	Total
No Dissociation (CADSS = 0)	236	189	425
CADSS > 1	220	129	349
Total	456	318	774

Chi-square=4.5; df=1 asymp. sig (2-sided): $p<0.035$

TABLE 2. Increased dissociation is associated with increased likelihood of failure: CADSS score of 5 or greater

	Fail SFAS	Pass SFAS	Total
CADSS <5	376	287	663
CADSS > 5	80	31	111
Total	456	318	774

Chi-square=9.3; df=1 asymp. sig (2-sided): $p<0.002$

TABLE 3. Increased dissociation is associated with increased likelihood of failure: CADSS score of 11 or greater

	Fail SFAS	Pass SFAS	Total
CADSS < 11	419	310	729
CADSS > 11	37	8	45
Total	456	318	774

Chi-square=10.8; df=1 asymp. sig (2-sided): $p<0.001$

TABLE 4. Predicting failure at SFAS

ROC coordinates of the curve: area under the curve=0.55; std error=0.02; asymp. sig: $p<0.02$

Positive if greater than or equal to the following:	Sensitivity	1-Specificity
-1.00	1.000	1.000
.50	.482	.406
1.50	.386	.308
2.50	.307	.233
3.50	.246	.189
4.50	.206	.138
5.50	.175	.097
6.50	.151	.075
7.50	.129	.057
8.50	.112	.047
9.50	.094	.035
10.50	.081	.025
11.50	.070	.022
12.50	.059	.019
13.50	.053	.016
14.50	.042	.016
16.00	.033	.006
17.50	.031	.006
18.50	.024	.006
19.50	.018	.006
20.50	.015	.006
23.50	.009	.003
25.50	.007	.003
27.00	.007	.000
36.00	.002	.000
45.00	.000	.000

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Prehospital Advances in the Management of Severe Penetrating Trauma

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Abstract

Background: Historic advances in combat prehospital care have been made in the last decade. Unlike other areas of critical care, most of these innovations are not the result of significant improvements in technology, but by conceptual changes in how care is delivered in a tactical setting. The new concept of Tactical Combat Casualty Care has revolutionized the management of combat casualties in the prehospital tactical setting. **Discussion:** The Tactical Combat Casualty Care concept recognizes the unique epidemiologic and tactical considerations of combat care and that simply extrapolating civilian care concepts to the battlefield are insufficient. **Summary:** This article examines the most recent and salient advances that have occurred in battlefield prehospital care driven by our ongoing combat experience in the Iraq and Afghanistan and the evolution around the Tactical Combat Casualty Care concept.

Warfare has historically resulted in significant advances in surgery and medicine. Although the present wars in Iraq and Afghanistan are asymmetric and unconventional conflicts, they are no exception. Like previous conflicts, this war presents military physicians and surgeons with tangible, new, and unique problems related to changing tactics, types of weapons, logistics, terrain, and environment. In the past, solutions were conceptualized only years after the war began. As a result, dating back to antiquity, lessons learned were forgotten and until the last 50 years, prehospital care changed very little. For example, Greek and Roman soldiers dressed wounds, applied splints, and moved casualties to the surgeon in a similar fashion as modern military medics. Historically, little attention was paid to prehospital battlefield care. Many believed Soldiers were either not able, because of combat actions, or capable, because of their lack of education, to perform significant medical interventions on the battlefield. Physicians or skilled medical providers are rarely present at the point of injury during combat and many young Soldiers die for lack of relatively simple life-saving interventions. In the last decade, U.S. military mind-set and doctrine changed resulting in significant advances in prehospital battlefield care. Furthermore, these advances were likely accelerated by necessity, driven by the recent conflicts in Iraq and Afghanistan.

Recent innovations in tourniquets, hemostatic agents, and intravenous fluid (IV) resuscitation strategies, many of which are mainstays of current prehospital penetrating trauma resuscitation and treatment, have been around for decades. These advances do not represent quantum leaps in technology, but rather improvements of existing techniques and devices when combined with application of Tactical Combat Casualty Care (TCCC) principles. The most significant change is the current conceptualization of care on today's battlefield. Previously, military prehospital care principles were simply extrapolated from improvements in civilian trauma care developed in the last two decades. Unfortunately, those resuscitation and treatment principles are based to a large degree on blunt vehicular trauma and civilian trauma systems, which are inherently different from the battlefield environment. Civilian prehospital trauma care presupposes adequate medical supplies, usually based around an ambulance, online and offline medical control, adequate number of providers, a stable and secure accident scene, and relatively rapid evacuation to a nearby hospital. These factors are all inverted on the battlefield where a single medic with limited supplies may be required to care for numerous casualties in a hostile or austere environment. For civilian providers, the casualty is the mission. For the military medic, the mission must often continue despite casualties. Unfortunately, many of these concepts are now applicable in certain civilian prehospital healthcare environments that become "austere" and/or tactical. Recent events such as the World Trade Center bombings and Hurricane Katrina have demonstrated the need for many of our out-of-hospital healthcare personnel to use some of the current military prehospital medical strategies. Finally, with the increased threat of possible terrorist bombings occurring on U.S. soil, civilian prehospital healthcare providers should be prepared to manage severe penetrating and explosive related injuries.

The inadequacy of the civilian trauma model for application in tactical situations was recognized by Butler and Hagmann in their landmark 1996 paper.[1] Since their publication, the concept of TCCC has been defined and now applied on today's battlefield.[2–7] TCCC is a set of principles that aim to prevent further casualties, accomplish the tactical mission, save the maximum number of lives, and minimize morbidity of the injured. The TCCC guidelines are based on treating the leading preventable causes of battlefield death, which include hemorrhage from a compressible site, tension pneumothorax, and airway compromise.[8,9] In the most recent TCCC guidelines, attention to hypothermia prevention, intravenous access, and pain management techniques are now also addressed. Detailed discussion of all TCCC principles as well as the in-depth management of explosive and penetrating injuries is beyond the scope of this article. However, we discuss the most salient and recent innovations in the prehospital treatment of penetrating trauma that have evolved within and around the concept of TCCC.

Hemorrhage Control

Uncontrolled hemorrhage resulting from traumatic injuries continues to be the leading preventable cause of death in both the civilian and current military environments, accounting for up to 40% of civilian and 50% of combat-related deaths.[9–11] Uncontrolled extremity or otherwise compressible hemorrhage remains the leading cause of preventable battlefield death; between 7% and 9% of all fatalities since the Korean conflict have occurred from wounds potentially amenable to first aid.[9] It is natural therefore that most of the advances in the prehospital management of penetrating trauma have been made in the area of hemorrhage control. During the current conflict, newer tourniquets, hemostatic agents, and dressings as well as intravenous therapies have been developed, researched, and fielded by the military with unprecedented speed.

Tourniquet

Tourniquets have been used on the battlefield since 1674.[12] Controversy and debate about the appropriateness and circumstances of tourniquet use began soon after and has continued today.[13–15] Despite many strong opinions against tourniquet use, this simple device is carried by every Solider on today's battlefield and is used frequently. Although exact statistics are lacking, there is ample anecdotal evidence from physicians, surgeons, and medics with recent combat experience that many lives have been saved by liberal use of properly applied tourniquets on the battlefield. One of the authors (RM) managed a casualty in Afghanistan who had his life saved twice on the same day by a tourniquet. The solider sustained an injury to his superficial femoral artery after a rocket attack. A fellow Soldier rapidly applied a tourniquet and stopped the hemorrhage. The patient remained alert and stable and was evacuated to a Field Surgical Team where he had his vessel repaired. During the two-hour flight to a combat support hospital (CSH), his injury began to rebleed profusely and the patient developed hemorrhagic shock. A second tourniquet was applied to stop the bleeding, allowing him to receive definitive surgical therapy.

One major concern from physician detractors includes the concern for severe ischemic or neurologic injury from the use of tourniquets. Several recent case series and case reports demonstrate no evidence that tourniquet use on the battlefield resulted in increased limb loss or permanent disability even among those who had unneeded tourniquets applied.[16–18] One case series reporting on tourniquet use during the Vietnam conflict detailed one case of limb loss secondary to tourniquet use out of thousands of casualties with vascular injuries. In these cases, fasciotomies were occasionally required when tourniquet time exceeded two hrs.[19] Most of the tourniquets used in this report were improvised with rubber tubing, rifle slings, belts, and so on, and not commercially fabricated as they are today (Figures 1 and 2). During that period, the Army issue strap-and-buckle tourniquets (NSN 6515-00-383-0565) were still used despite criticism regarding their ineffectiveness as early as World War II.[20] Not surprisingly, improvised tourniquets are either ineffective and/or produce tissue injury by themselves. Rubber surgical tubing, for instance, generates a significant amount of pressure that is difficult to regulate.[14] Improvised tourniquets are not recommended and should be used with extreme caution.

Figure 1. *Combat application tourniquet.*

Figure 2. *Combat application tourniquet in place.*

Interestingly, other statistics or case series regarding tourniquet use during the Vietnam conflict are unavailable except a report by Bellamy who documented 5,000 fatal injuries that may have been amenable to tourniquets.[8] Much of the derision over tourniquet use derives from surgeons in previous conflicts who have anecdotally witnessed casualties that lost a limb or experienced significant neurovascular injury as a result of prolonged application of an improvised tourniquet. However, these same surgeons did not see the casualties who never reached their care because they bled to death for want of a tourniquet. The current TCCC recommendation is for liberal use of tourniquets for uncontrolled extremity hemorrhage in the tactical environment.

Hemostatic Agents

A number of new hemostatic products have been developed and used in combat trauma settings for severe uncontrolled bleeding in the prehospital setting. In the past few years, tremendous advances have been made in the development of advanced hemostatic products for use in uncontrolled external hemorrhage on the battlefield. Current research and fielding of these agents has generated a great deal of excitement within the field of military combat casualty care. There is growing interest in the civilian trauma community, because these products hold the promise of saving lives both in civilian

and military situations.[20–23] Some of these U.S. Food and Drug Administration (FDA)-approved hemostatic products have been successfully used in current combat operations after evaluation in randomized animal studies. Although several different hemostatic agents (Table 1) have been studied and/or are commercially available, our clinical experience demonstrates that not all are effective in severe hemorrhage.

Table 1. Hemostatic agents

Name	Company	Active Ingredient	Mechanism of Action	Approved Indication for Use
Dry Fibrin Sealant Dressing (DFSD)	American Red Cross, Holland Laboratory, Rockville, MD	Fibrinogen, thrombin, factor XIII, Ca^{+2}	Direct application of highly concentrated coagulation factors to site of injury; polymerization and cross-linking of fibrin	Not FDA-approved
Rapid Deployment Hemostat (RDH)	Marine Polymer Technologies, Danvers, MA	Proprietary algae-derived polysaccharide polymer, consisting of fully acetylated poly-*N*-acetyl-glucosamine (chitin)	Accelerates the concentration of red blood cells, clotting factors, and platelets at the bleeding site; induces vasospasm	External hemorrhage
Chitosan Dressing (HC)	HemCon, Inc., Tigard, OR	Polysaccharide polymer, consisting of deacetylated poly-*N*-acetyl-glucosamine (chitosan)	Adheres to tissue strongly, sealing wound site; may secondarily accelerate the concentration of red blood cells and platelets at the bleeding site	External hemorrhage
ChitoFlex	HemCon, Inc., Tigard, OR	Polysaccharide polymer, consisting of deacetylated poly-*N*-acetyl-glucosamine (chitosan)	Adheres to tissue strongly, sealing wound site; may secondarily accelerate the concentration of red blood cells and platelets at the bleeding site	External hemorrhage
QuikClot (QC)	Z-Medica, Newington, CT	Granular zeolite	Adsorbs water, concentrating red blood cells, clotting factors, and platelets at the bleeding site in an exothermic reaction	External hemorrhage

FDA, Food and Drug Administration.

Moreover, several products are not FDA approved and/or have not been thoroughly studied in human trials. Currently, three agents are used in ongoing military operations: QuikClot, HemCon Bandage,and ChitoFlex.

The HemCon® (HC) bandage is an FDA approved hemostatic agent that is currently used in combat and in a limited portion of the civilian prehospital environment for the external control of severely bleeding wounds. The HC dressing has previously demonstrated efficacy in both human[24] and animal studies.[25,26] Chitosan is a biodegradable, nontoxic, complex carbohydrate derived from chitin (poly β[1 to 4]-N-acetyl D-glucosamine), a naturally occurring substance. Chitosan is the deacetylated form of chitin. The generic term chitosan generally is applied when the extent of deacetylation is above 70% and the generic term chitin is used when the extent of deacetylation is insignificant or below 20%. In the form of an acid salt, chitosan demonstrates mucoadhesive activity.[27] Different forms of chitosan have been used to enhance hemostasis in animal studies involving bleeding from esophageal varices, arterial catheter puncture sites, peritoneal abrasions, or similar experimental insults.[28,29] Initial distribution to the military included forward deployed medics followed by a more general distribution to physicians and physician assistants located in both Iraq and Afghanistan as more bandages became available. Over 600,000 bandages have now been distributed into combat operations in Iraq and Afghanistan. The use of this bandage is a standard component of the Prehospital Trauma Life Support military section and is taught to all Special Operations Forces and conventional Army medics in their respective training schools. One report cites the HC bandage as successfully controlling hemorrhage in 97% of uses. This report has numerous methodologic flaws, is retrospective in nature, and includes uses of the dressing in minor injuries.[24] The U.S. Army currently supplies an HC bandage (Figure 3) to every deployed Soldier, three for every Combat Life Saver, and five to every medic in the combat theater. These bandages now join the tourniquets carried by all Soldiers as the individual and medic-carried hemostatic devices of choice for severe combat injuries in the U.S. Army. Unlike other products, there are no known harmful effects associated with use of this dressing.

Figure 3. *HemCon or chitosan dressing.*

QuikClot® (QC) is an FDA-approved hemostatic agent consisting of a granular zeolite powder with 1% residual moisture that, when placed on a bleeding wound, absorbs water in an exothermic reaction, thereby concentrating platelets, erythrocytes, and clotting factors at the site of application.[20] QC is sta-

ble in ambient temperature extremes and does not require special packaging or preparation before use. In one swine study of lethal grade V liver injury, QC was found to be effective[30] as well as in both femoral arterial and venous injury.[31] QC was found to decrease both blood loss and the time to hemostasis in nonlethal wounds of skeletal muscle, liver, and the femoral vein, although this was not found in longitudinal wounds of the femoral artery. QC has been included within the newly redesigned Marine Corps individual first aid kit, and there are a number of anecdotal case reports from U.S. Naval medical personnel of successful use in injured troops in Iraq and Afghanistan.[31]

One major concern about QC is the potential for surrounding tissue damage caused by the exothermic reaction.[32] Another important issue includes the extent of training necessary to use the product effectively and safely.[33] The company recently modified QC to decrease the exothermic reaction.

More recently, a more flexible chitosan-based bandage was FDA-approved, the ChitoFlex™ (CF). The CF bandage uses the same materials and technology as the HC bandage but is designed to be packed into a wound track to control bleeding. This bandage may be especially helpful to control severe bleeding from small penetrating injuries such as those resulting from small arms fire or shrapnel that cannot be addressed by other means. Successful use of the CF bandage is documented by military medical personnel in the prehospital and the Level III (CSH) facility in Operation Iraqi Freedom.

The ideal prehospital hemostatic agent would require little training; be nonperishable, durable, flexible, and inexpensive; adhere to the wound only; pose no direct risk of disease; not induce a tissue reaction; and effectively control hemorrhage from arterial, venous, and soft tissue bleeding. Obviously, no single ideal advanced hemostatic agent currently meets all of these criteria for either military or civilian use. However, most of the current FDA-approved hemostatic agents appear to be safe with the exception of the exothermic reaction induced by the original QC product, although thermal tissue damage depends on the ratio of QC and blood at the site of injury. Currently, many of these hemostatic agents are used for uncontrolled hemorrhage on today's battlefield and have contributed to reduced morbidity and mortality in penetrating combat trauma.

Hemostatic Intravenous Agents: Active research to optimize prehospital hemorrhagic control in the combat prehospital environment in the future focuses on the use of IV hemostatic agents. Recombinant Factor VII activated (fVIIa), for example, has been used on hundreds of casualties dying from hemorrhagic shock and requiring massive transfusion. In one CSH, fVIIa was associated with improved coagulopathy, decreased blood requirements, and a trend toward improvement in mortality. As a result of the retrospective nature of these data and the confounding factors associated with the treatment of these patients in the combat zone, definitive recommendations regarding its use cannot be made. The appropriate indications for use are still being evaluated but in selected combat prehospital settings, and a prospective multicenter study is ongoing to evaluate the efficacy and safety of fVIIa in trauma patients.[34]

Intravenous Access and Fluid Resuscitation

Before the development of the TCCC concept, battlefield medics were trained to follow the American College of Surgeons' Advanced Trauma Life Support guidelines, including the insertion of large-bore IV catheters and infusion of 2L or more crystalloid fluid. Although this practice may be appropriate in the hospital setting, Bickell demonstrated that patients with penetrating trauma to the torso given IV fluid resuscitation in the field had increased mortality than those not given IV fluids in the field.[35] The rationale for the mortality differences seen in these patients with uncontrolled sources of hemorrhage includes subsequent vasodilation, increased arterial pressure, and dilution of clotting factors with liberal administration of crystalloid resuscitation, which worsens bleeding through injured vessels.[36]

Before Operation Iraqi Freedom/Operation Enduring Freedom, medics carried as much as 30 pounds of crystalloid IV fluids to the field. Often, individual Soldiers carried an IV infusion set and 1L bag of fluid weighing more than two pounds each. In the past, military units placed significant training emphasis on Soldiers' ability to obtain IV access. This skill, likely because of its technical and invasive nature, is unfortunately regarded as "great medical training" by many Soldiers and commanders alike, often to the detriment of more mundane yet more important skills such as hemorrhage control and tourniquet application. In 1993, one of the authors (RM) placed IVs in several casualties while under fire during a battle in Mogadishu, Somalia. He carried 6L of crystalloid, weighing 13 pounds, starting IVs in all casualties with gunshot wounds. Soon there were more than a dozen casualties with only one losing a significant amount of blood and showing clinical signs of shock from a gunshot wound to the leg. By this time, his IV fluids were depleted. In hindsight, working to place IV lines in mostly stable combat casualties while under enemy fire was a foolish waste of time.

The current recommendations for IV resuscitation on the battlefield focus only on those patients with signs of hemorrhagic shock. The best indicators of hemorrhagic shock on the battlefield are altered mental status in absence of head injury and a weak or absent radial pulse. Because the majority of combat casualties present with nonlife-threatening penetrating extremity injuries, the number of casualties actually requiring IV fluids in the field is few. Current TCCC guidelines recommend an infusion of 500mL bolus of Hextend with a repeat bolus in 30 mins only if shock is still present. Further fluid administration is not likely to be of benefit and is not advised, the exception being the head-injured patient in whom additional fluids may be of benefit in preventing secondary brain injury from hypotension defined as systolic blood pressure <90mmHg.

Hextend®, a synthetic colloid, is currently recommended over crystalloid solutions. Hextend remains in the intravascular space longer resulting is improved volume resuscitation and less fluid requirements overall. These factors are critical when supplies must be carried in the medic's pack. Future battlefield resuscitation strategies may include hypertonic saline or combinations of hypertonic solutions and colloids.[37] A growing scientific literature supports limited volume resuscitation. The degree of sustainable hypotension is contentiously debated among experts.

IV access methods have evolved to fit the tactical setting as well. TCCC focuses on placement of IVs and IV therapy in only patients displaying clinical signs of shock. Not uncommonly, these patients demonstrate significant vasoconstriction making placement of a peripheral IV difficult. As a result, medics are now trained to obtain intraosseous (IO) access for fluid administration. Current TCCC recommendations list the Pyng FAST-1 sternal IO as the device best suited for trauma care on the battlefield.[38–40] IO devices that have been used extensively in pediatrics have been previously thought to be difficult to use in adults because of ossification. Contrary to this popular belief, we have used IO devices in thousands of combat-related injuries on adults with great success both in the sternum/clavicle as well as the tibia. Large volumes of resuscitative fluids as well as medications can be safely and effectively administered IO.

Chest Wounds

Tension pneumothorax represents the second leading cause of potentially preventable battlefield death resulting in 3% to 4% of all fatal injuries.[41, 42] McPherson and colleagues studied radiologic and autopsy examinations of 978 fatalities from the Vietnam conflict[41] and discovered that 15 of the casualties with identified tension pneumothorax lived long enough to be treated by a medic. Unfortunately, none underwent needle decompression and all died.

Insertion of a needle into the chest wall to relieve a tension pneumothorax is a controversial procedure in the civilian trauma setting with some prominent trauma physicians strongly recommending against it.[42] The true incidence of this injury is unknown in the civilian setting, although its occurrence is rare and an evidence-based trial to determine whether patients benefit or do worse from needle decompression is not feasible.

Tension pneumothorax is likely more prevalent in the military setting in which penetrating injuries predominate. The exact incidence in the current conflict is unknown and efforts are underway to replicate McPherson's study with Iraq and Afghanistan casualty data. It is likely that the universal prevalence of body armor worn by all U.S. combatants has decreased the incidence below that in Vietnam. However, until new data are available, tension pneumothorax must be assumed to remain the second leading cause of preventable battlefield death.

Currently, TCCC guidelines recommend consideration of needle decompression in casualties with chest trauma and progressing respiratory distress.[26] Recent radiologic studies done by Harke et al. showed the mean chest wall thickness of most deployed Soldiers is 5.36cm. Based on his findings, an 8cm angiocatheter is recommended for needle decompression.[43]

Airway Management

Airway compromise is the third leading cause of potentially preventable battlefield death.[8] Although the incidence in the conflicts in Iraq and Afghanistan is unknown and is currently being studied, historically, airway compromise is responsible for approximately 1% of fatal injuries on the battlefield. According to Bellamy's analysis from the Vietnam era, approximately 80% of these injuries are the result of facial or neck trauma causing obstruction and compromise of the airway.[8]

Given the high incidence of trauma as a cause of airway obstruction, cricothyroidotomy is currently emphasized as definitive airway management on the battlefield. In unconscious patients with intact upper airway anatomy at risk for airway compromise, the recovery position and minimally invasive adjuncts such as the nasal pharyngeal and the oral pharyngeal airway are emphasized.[21]

The emphasis placed on cricothyroidotomy as the definitive airway management maneuver of choice by enlisted field medics causes many hospital-based physicians some anxiety. It has been suggested by some that medics perform endotracheal intubation or use other adjuncts such as the laryngeal mask airway, the Combitube®, or the King Laryngeal Tube™ airway. Endotracheal intubation is not emphasized because it requires significant training and experience to correctly perform. Recent research in the civilian prehospital setting has documented some significant complications arising from rapid sequence intubation performed in the field by trained paramedics in busy urban trauma systems. The practice of rapid sequence intubation by medics in the field is being challenged by some researchers.[44,45] As a result, enlisted medics are not trained in the performance of rapid sequence induction. This is a specialized skill requiring a significant amount of training not only in performing the motor skills of inserting an endotracheal tube, but also in understanding the pharmacology of the requisite sedating and paralyzing drugs. The initial training requirements as well as sustainment training of this skill for all military medics are simply not feasible. Additionally, the white light required for laryngoscopy may draw enemy fire on the battlefield. Furthermore, based on the best available data, the majority of patients who need airway management will likely have disrupted upper airway anatomy and will require a cricothyroidotomy anyway. Adjuncts such as the laryngeal mask airway and Combitube® will also require sedation to be tolerated and may be difficult to place if the anatomy is disrupted as a result of trauma. This is an area of continued research and evolution.

Hypothermia Management

Hypothermia has been well recognized as an independent contributing factor for increased morbidity and mortality in trauma patients. Previous studies demonstrate that hypothermia is associated with increases in coagulopathy, multiple organ failure, length of hospital stay, and mortality.[46, 47] In the care of the patient with traumatic injuries, focus has been placed on prevention and correction of hypothermia, especially in the prehospital setting. Hypothermia occurs in trauma patients for several reasons, including prolonged prehospital times, cold fluid administration, environmental factors affecting patients' core temperature, and the trauma in itself, which causes bleeding and hypoperfusion, both altering the body's thermoregulation with resultant hypothermia. TCCC emphasizes prevention of hypothermia (<34°C) in patients with penetrating trauma. Attention to hypothermia prevention decreases the deleterious effects of heat loss and decreases deaths from uncontrolled hemorrhage and is much easier than treatment of hypothermia. Therefore, prevention of heat loss should start as soon as possible after wounding. This will be optimally accomplished in a layered fashion with rugged, durable products located at close to the point of injury. Several techniques are

being used in the current conflict, including the improvised "hot pocket" whereby a casualty is wrapped in successive layers of wool blankets, a reflective survival blanket, and placed in a modified body bag. North American Rescue Products (Greenville, SC) markets a hypothermia prevention kit, which includes a high-performance, heat-reflective shell that is self-heating and allows 360° access to the patient. Several other devices are currently being tested and fielded in the combat prehospital setting for hypothermia prevention (Table 2).

Triage and Advanced Vital Signs

It has been hypothesized that some trauma deaths may be preventable if the severity of blood loss could be recognized earlier during prehospital medical care. Current trauma triage criteria are used to determine the patient's mode of transport, the priority of treatment, destination for treatment, injury severity, mortality, and need for a lifesaving intervention (LSI).[48–57] However, most of these existing triage tools are based in part on the presence of abnormal standard vital signs in the patient.[58, 59]

Common vital signs are used in the civilian prehospital setting because these measurements are usually readily obtainable and it is assumed that they provide a snapshot of patient stability. However, such an assumption is problematic because the physiology of the trauma patient experiencing severe hemorrhage is dynamic and may not reflect the true degree of hypoperfusion present as a result of normal physiological compensatory mechanisms. Initial systolic blood pressure less than 90mmHg and a Glasgow Coma Score motor component less than six has previously been shown to provide higher sensitivity and better specificity for prediction of mortality and the need for a possible LSI than most traditional vital signs (respiratory rate, heart rate, and so on).[58] More sensitive markers of acute hypoperfusion are required to identify hemorrhage and circulatory shock at the earliest time to improve resuscitation outcomes. Unfortunately, vital signs are not very sensitive because studies demonstrate that young patients can lose up to 60% of total circulating blood volume and remain relatively asymptomatic.[60] Therefore, determining the injury status in patients with normal vital signs is a critical step for the improvement of current field classification systems and development of triage decisions. Thus, the current process and practice of prehospital trauma triage and care may be significantly improved by providing additional advanced, noninvasive physiological measurements of early indicators for blood volume loss and impending circulatory collapse.

In an attempt to provide new possibilities for more efficient algorithms that may assist in determination of treatment and evacuation priorities for patients with unrecognized hypovolemia, new and more accurate noninvasive indicators of the underlying physiological status in trauma patients who possess initial normal systolic blood pressure and Glasgow Coma Score motor component have been investigated and implemented in current combat operations. Some of these earlier and possibly more reliable indicators of hypovolemia include derived physiological variables (that is, shock index, pulse pressure, field trauma score)[61–63] and continuous "real-time" variables (electrocardiographic R-wave amplitude, heart rate variability).[64, 65]

Transportation and Monitoring

Currently, the care for combat casualties in transport is varied depending on location, type of transportation used, tactical situation, and location of receiving facility. Military capabilities for care of casualties during transport differ from civilian capabilities in three fundamental ways: a) combat medical personnel who accompany the casualty during transport may not have advanced medical training compared with civilian emergency medical system medics; b) combat flight medics must perform their role as warfighters to assure crew and aircraft safety in a hostile environment; and c) the availability of resources such as monitors, oxygen, and resuscitation fluids are restricted as a result of weight and space limitations in the combat environment. Furthermore, for combat casualty transportation, there exists a wide variety of transportation platforms ranging from improvised litters to mobile intensive care units. Preplanned surface evacuation vehicles are usually ground ambulances, but potentially could be watercraft in some scenarios. Preplanned air evacuation from tactical settings is most often accomplished by helicopter, but airplanes may be required for longer distances. Vehicles of convenience can be used when absolutely vital, but this necessity usually represents a failure of premission contingency planning.

Because of these vast differences in transport medical vehicles and personnel capabilities, the TCCC program has focused on developing monitors that use advanced development of a semiautomated decision support capability for closed-loop resuscitation and oxygen delivery.[66, 67] The use of such "closed systems" may provide advanced decision support and treatment protocols to aid in decreasing morbidity and mortality in combat trauma patients. Current systems use standard vital signs (for example, blood pressure, arterial oxygen saturation) but, as previously discussed, are unfortunately inadequate for early detection implementation of LSI for patients in early shock. Thus, recent research has focused on the use of metrics and advance physiological variables that may be more specific for detecting early shock.[62–67]

Analgesia

Pain is one of the most common reasons Soldiers seek medical attention in the combat environment. However, the combat environment exacerbates the typical challenges found in treating acute pain, including lack of supplies and equipment, delayed or prolonged evacuation time and distances, devastating injuries, provider inexperience, and dangerous tactical situations. These factors contribute to the difficulty in controlling a Soldier's pain in combat. Previous studies have shown that failure to recognize and appropriately treat acute pain may result in an increased incidence of chronic pain and posttraumatic stress disorder.[47, 68] Because of this, there have been several developments in prehospital combat analgesia for the recognition, treatment, education, and research for battlefield pain management.

In previous conflicts, the main treatment for acutely wounded Soldiers in the prehospital setting of the battlefield was morphine, usually delivered by the intramuscular route. However, on today's battlefield, IV morphine is emphasized for combat casualties requiring analgesia. As discussed previously, improved IV access training and newer IO devices have improved access and delivery of analgesia. Furthermore,

many medics now carry promethazine to relieve nausea associated with pain and narcotic administration. In addition to improved delivery and titration of narcotics for combat pain, most Special Operation Forces in the prehospital, combat environment carry a "pill pack." This pack contains a cyclooxygenase-2 (COX-2) preferential inhibitor, meloxicam, and acetaminophen to be self-administered by the individual Soldier who sustains a painful injury. The use of preferential COX-2 inhibitors instead of nonspecific nonsteroidal anti-inflammatory drugs for moderate pain on the battlefield is because nonsteroidal anti-inflammatory drugs have the potential for platelet dysfunction.[69] Meloxicam does not appear to have this effect.[70] An earlier iteration of the pill pack contained the selective COX-2 inhibitor rofecoxib, which was replaced with meloxicam after concerns arose regarding rofecoxib. The combination of these oral medications is synergistic, provides multimodal analgesia, is opioid-sparing, and does not prevent the Soldier from carrying his or her weapon.

Finally, other newer agents and routes of delivery are currently being used on the battlefield to treat analgesia. Oral transmucosal fentanyl citrate has been found to relieve moderate to severe pain on the battlefield and is currently carried by many Special Forces medics. An initial dose of 400µg is used, which typically causes peak plasma concentrations of no greater than 2ng/ml; this plasma concentration is associated with a marked increase in the risk of respiratory depression. Oral transmucosal fentanyl citrate has a black box warning and its use is off-label for the treatment of acute pain in opioid-naive patients.[71] Because it reaches maximum serum levels after approximately 30 minutes, redosing may start 15 minutes after the previous unit has been completed (30 minutes after the start of the previous unit). It is important to note that although the median time to peak plasma concentration for 400µg was 25 minutes, time to peak plasma concentration demonstrated a wide range (20 –240 minutes).[71]

Ketamine has also been used successfully as a prehospital analgesic in the combat setting.[72] Ketamine in subanesthetic doses is an almost ideal analgesic because of its profound pain relief, its potentiation of opioids, its role in preventing opioid hyperanalgesia, and its large margin of safety.[73–75]

Education, training, and performance of peripheral nerve blocks are also now being used in the prehospital combat environment, especially for extremity injuries.[72] More difficult techniques like catheters and advanced blocks are not done in this setting as a result of limitations in equipment and training. However, local wound infiltration or basic blocks such as fascia iliacus, intercostal, or suprascapular placed before transport can provide profound analgesia.[76, 77] These blocks also afford a very low risk–benefit ratio. Use of regional anesthesia is an important technique for combat casualties. When performed in the prehospital setting on the battlefield, limited regional anesthesia techniques carry little risk such as changes in respiratory or mental status and allow the Soldier to possibly perform some minimal duty while awaiting evacuation. More advanced techniques such as the suprascapular or interscalene block can be associated with diaphragm dysfunction and higher incidences of inadvertent intraarterial injection or pneumothorax.

Training and Education

Proper training and education is also a challenge for military prehospital providers. To ensure the discussed initiatives are appropriately trained and retained, newer methods to educate and train prehospital providers have been adapted. The use of scenario-based, "real-time" training, simulators, and live tissue training have all been incorporated with success.[78] This type of training focuses on "evidence-based" epidemiology from the current battlefield collected by the Joint Theater Trauma System.[79] Use of such "real-time" epidemiology and feedback could help guide future education training and equipment for prehospital trauma.

Conclusion

Improved medical training and education and technologic advances have resulted in the lowest mortality seen in U.S. history. Even in this new global era, some readers may wonder why and how combat casualty care is important to them and their patients. The reasons become readily apparent when examining the parallels between combat settings and other austere or hostile environments such as tactical emergency medical support for law enforcement, wilderness, and disaster medicine and in coping with the effects of weapons of mass destruction. The lessons of Vietnam and the development of trauma systems, the "golden hour," and air medical services provide additional reminders of the mutual benefits gained by military and civilian practice from previous conflicts. The role of combat prehospital medical care continues to be diverse, conflicting, and disquieting at times yet remains a pioneering and crucial part of modern medicine and national defense.

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Results of Vietnamese Acupuncture Seen at the Second Surgical Hospital

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One of the rewards in the medical service in a foreign land is the exposure to exotic diseases and methods of therapy which are virtually unknown to many physicians in the western world. With the treatment of Vietnamese patients by medical personnel from the United States and other countries with a similar system of medical education, new experiences and challenges are presented daily. The use of acupuncture as a form of therapy is undoubtedly as unfamiliar to many physicians as it was to us. In addition to our treatment of American casualties at the Second Surgical Hospital in the Republic of Vietnam, we had the opportunity of treating some interesting problems in Vietnamese patients who had previously been treated with acupuncture. The majority of our own staff questioned, "What is acupuncture?"

Historical Background

The principles and techniques of acupuncture were first documented in *The Yellow Emperor's Classic of Internal Medicine (Canon of Medicine)* in China between the fifth and third centuries B.C.[1,2,3] During the sixth century A.D., Chinese medicine found its way into Japan where moxibustion, the ignition of combustible wormwood cones, had been utilized in the same anatomical areas used for acupuncture.[1] Acupuncture was introduced into Europe at the end of the 17th century, but it was not until the end of the 18th century that it received wide recognition and employment, particularly in France and Germany.[4] An excellent review of the subject appeared in 1962.[1]

In brief, the original acupuncture technique consisted of the insertion of sharp needles of different composition into specified points on the body at varying depths with the needle left in situ for a period lasting from minutes to one or more days. The selection of 365 specific points on the body has an Oriental philosophical basis. Traditionally, this was founded on the dual force of ever-recurring changes of Tao, the immutable course of nature, with the dual force through which Tao acts being called Yin and Yang. A complete description has been outlined by Veith.[1] Yin and Yang were subsequently interpreted to be conveyed through the body by 12 hypothetical main channels corresponding to the months of the year with the 365 acupuncture points representing the days of the year. Insertion of needles into one or more points related on a meridian to a particular organ or portion of it was believed necessary to restore the equilibrium of Yin and Yang in the treatment of illness in general. The number of acupuncture points has varied considerably over the centuries and a different school has described as many as 1000 points. Of these, about 50 points are said to help the patient when stimulated, approximately 900 points are more or less neutral, and about 50 will make the patient worse.[5]

In China the earliest needles were flint but the most common needles have been gold and silver, alleged by some to have different effects. Stiefvater[3] cites good results in France and India with pure steel needles and feels the composition of the needle is not of importance. The depth and period of needle placement have been considered to be important and often the needles are placed with the use of a hammer utilizing a rotary motion of the needle.

Present Status of Acupuncture

Considering the modern advancement of medicine in the western world, it is difficult for many to believe that acupuncture continues to be utilized throughout the world and may even be increasing. Political as well as traditional influences have stimulated the increase in acupuncture therapy in Communist China. Recent records include treatment of 116 cases of appendicitis in Shanghai in 1958,[6] 323 cases of pulmonary tuberculosis in Peking in 1955-1959,[7] biliary ascariasis in 48 patients in 1958-1959 in Anhwei,[8] and 23 cases of epilepsy in Peking in 1959.[2] Even in medically enlightened countries, by western standards, such as France and Germany, acupuncture has its followers. The International Society of Acupuncture has its headquarters in Paris and the German Society for Acupuncture has a bimonthly publication.[1] Acupuncture remains a mode of therapy in areas of Japan and since 1958 has become popular in some fields of medicine in Russia. It is even in very limited use in the United States as noted in a recent lay publication. An August 1966 issue of a Hong Kong newspaper reported that two British Acupuncturists (the chairman of the British College of Acupuncture and a member of the Board of Directors of the College) were visiting the President of the Kowloon College of Chinese Medicine and Acupuncture for talks on the subject as well as to compare Eastern and Western methods of use. Also an advertisement was noted in the official guide book of the Hong Kong Hotels Association (1966) offering acupuncture treatment along with Psycho-Hypno-Therapy. It should be noted that the Germans describe two schools of acupuncture: that of the traditionalists who follow the ancient Chinese precepts utilizing gold needles for Yang and silver needles for Yin; and that of the innovators who add new techniques, needles of varying composition, and additional acupuncture points.[1]

Vietnam Experience

Although the primary mission at the 2d Surgical Hospital in the jungle highlands of the Republic of Vietnam has been surgical care of the American wounded, emergency care was also provided to local Vietnamese patients. In a nine-month period, January 1966 through September 1966, a total of 145 Vietnamese patients were admitted (approximately eight per cent of the total admissions). In addition,

over 350 Vietnamese outpatient visits were made to the emergency room. Consultation was also provided to the local Vietnamese dispensary and hospital. The following interesting cases involving local acupuncture are presented.

Report of Cases

Case 1 — A 14-year-old pregnant Vietnamese female with acute appendicitis was admitted on 24 July 1966 and an appendectomy performed. She had been treated by a combination of needle puncture and scratches of the skin. We have heard of cases in Vietnam where the skin is scratched with sharp pieces of glass to obtain a therapeutic effect.

Case 2 — A 24-month-old child with a five-day history of obstipation, abdominal distention, vomiting, and fever was admitted on 21 July 1966. Although a correct preoperative diagnosis of volvulus of the sigmoid colon was made, surgery was performed because of possible compromise of the bowel in the presence of leucocytosis, tachycardia, temperature elevation, and the unavailability of fluoroscopy.

Case 3 — A ten-year-old thin Vietnamese male was admitted with an acute surgical abdomen on 27 May 1966. By history he had been treated by acupuncture for abdominal pain four days prior to admission and had numerous acupuncture marks on his abdomen. With the preoperative diagnosis of generalized peritonitis secondary to a ruptured viscus, an exploratory laparotomy was performed. Approximately 300cc of purulent material was found free in the peritoneal cavity without any evidence of a perforated viscus, appendicitis, or abscess formation. Marked inflammation of the peritoneum prevented positive identification of an acupuncture penetration. There was no reason to doubt, however, that the purulent peritonitis was secondary to unsterile acupuncture needles with or without bowel penetration. His postoperative course was essentially uncomplicated and he was discharged home on 16 June 1966.

In the literature, mention is made of Berlioz in France introducing the acupuncture needle so deeply into the epigastric region in a man with a convulsive cough, that he thought he had pierced the stomach.[4] Apparently deep needle insertions may be used.

Case 4 — A 43-year-old Vietnamese male entered the emergency room with a chief complaint of dull right upper quadrant pain of several days duration. A clinical diagnosis of acute cholecystitis was made. He responded rapidly to proper medical management and was completely asymptomatic in three days. Four puncture wounds surrounded by local erythema and minimal induration were noted in the abdominal wall. Through an interpreter a history of recent acupuncture therapy was established.

Case 5 — During a visit to the An Khe Dispensary, an elderly Vietnamese male with cerebral malaria was seen who had multiple acupuncture marks on his abdomen as shown.

Case 6 — One of our Army doctors treated a patient in the local Vietnamese hospital for an elbow joint infected secondary to acupuncture therapy. This should emphasize the dangers of infection from unsterile acupuncture equipment.

Comments

Although there is a considerable following in acupuncture therapy, it seems that most of the "success" would be in treating psychosomatic illness. There is little anatomical or physiological basis for acupuncture by generally accepted standards of western medicine. Even two advocates of acupuncture, Huard, a professor of medicine in France and former dean of the faculty of Medicine of Hanoi, Indo-China, and Wong state: "The action of acupuncture is still poorly understood ..."[10] Acupuncture has been described as curing everything from schistosomiasis to rheumatism, but failures are also admitted. Poor results can be overlooked by those who believe in acupuncture by stating that only a well-trained practitioner would have good results. Negative results have also been attributed to improper selection of acupuncture points, improper angle and depths of needle insertion, and needles made of the wrong material. Lavier[9] emphasizes precautions to be observed. The large Chinese series of appendicitis cases treated by acupuncture rather than by surgery with concomitant pathological examination, is believable only in those cases which admittedly progressed to abscess formation. Of course, advocates of acupuncture could also cite failures in treatment in our country.

Summary

In briefly reviewing the subject of acupuncture, an attempt is again made to familiarize American physicians with this ancient practice which is still a therapy for millions. Although our contact with Vietnamese patients has been limited, six cases of acupuncture failures in Vietnam have been reviewed. We have no control study for comparison and no experience to describe successful use of acupuncture; and one who believes in acupuncture could rapidly point out that our limited knowledge of acupuncture therapy prevents our full understanding and allows our basic distrust. Nevertheless, we have difficulty in finding a logical basis for acupuncture in the therapy of organic disease. It seems that harmful effects of acupuncture are most manifest in delay in diagnosis and treatment as well as in potential septic complications. Even an isolated practitioner of acupuncture in the United States must be cognizant of possible legal ramifications engendered by a failure to measure up to the community standard of medical practice. Due to the current situation in Southeast Asia more physicians will come into contact with the practice of acupuncture and should at least have some knowledge of the subject.

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Overview of Combat Trauma in Military Working Dogs in Iraq and Afghanistan

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Introduction

Military working dogs face the same dangers in combat as human servicemembers, and serious traumatic injuries are not uncommon in these dogs. Ballistic, explosive, and blunt trauma has occurred in many dogs and veterinarians in combat zones must be prepared to manage these cases. Even before reaching veterinary care, dog handlers, medics, and other human medical providers are faced with providing lifesaving treatment on canine servicemembers at the point of injury.

Deployed Veterinary Personnel

Historically, veterinary teams in deployed units tasked with caring for working dogs have not been trained, staffed, or equipped to manage major trauma, focusing instead on day-to-day care and medical management of working dogs in their respective theater of operations.[1] The majority of their work in theater actually focuses on food safety, which, overall, is the largest portion of their daily duties. Occasional serious injury or illness was considered the exception rather than the rule, to be dealt with when it occurs. Training given to Army Veterinary Corps officers and enlisted animal care specialists (veterinary technicians) to ensure proficiency in managing these cases was proportional to the likelihood of it actually occurring, which was considered unlikely. With occasional exceptions, veterinarians assigned to these units are usually veterinary field officers (AOC* 64A), often junior captains who usually have no formal clinical training after graduation from veterinary school. In rare cases, they entered the military after internship or residency training. Internship or residency training is not a requirement to practice veterinary medicine, and only a small percentage of graduate veterinarians pursue this advanced post-graduate training. The Veterinary Corps has an extensive program which allows veterinarians to complete clinical residency training, but there are no assigned positions within the deployable units for residency-trained clinical specialists. Veterinarians preparing to deploy often complete the Army's Veterinary Clinical Proficiency Course, an intense 1-week classroom and hands-on review of common emergency and surgical treatments, along with certain diagnostic methods.

In both Operations Iraqi Freedom and Enduring Freedom, there are only a handful of veterinary treatment facilities among the extensive number of bases which house working dogs, and transport time to veterinary care may be anywhere from hours to days, depending on the situation. Human medical providers such as medics, physician's assistants, and physicians are often faced with providing lifesaving care to injured working dogs until they can be transported to a location with a veterinary treatment facility in-theater.

Since 2005, a veterinary clinical medicine officer (AOC 64F), either a surgeon or internal medicine specialist, has been assigned to the deployed veterinary unit in Iraq to augment the existing veterinary capabilities. This has proven very helpful with serious medical and surgical cases, although some serious trauma cases still present to the veterinary field officers at remote forward operating bases throughout the theater. Thus, the veterinary field officer may be the only veterinarian in the area and is responsible for managing major canine trauma. A veterinary clinical specialist has not been specifically assigned to the Afghanistan Theater. However, the Army Reserve has provided veterinary coverage in that theater. Many Army Reserve veterinarians are practicing clinical veterinarians in civilian life and therefore come to theater with extensive clinical experience.

The current conflicts in Iraq and Afghanistan have defied doctrine and the "status quo" of deployed veterinary operations. The likelihood of seeing a critically wounded military working dog increased profoundly with the rise of the insurgency. Veterinary officers and enlisted animal care specialists deploying with deployable veterinary units must be prepared for this occurrence. Despite the limitations in equipment, staff, and training, deployed veterinarians have adapted to the challenge and done an excellent job in managing these cases.

Injuries And Wound Distribution

There is currently no standardized database to capture injury data in working dogs, such as the Joint Theater Trauma Registry for injuries in human servicemembers. Studies to analyze canine injuries or illness in theater have relied on massive data calls, word-of-mouth reporting, or screening records of deceased working dogs once the medical record is sent for archiving at the Department of Defense Working Dog Center at Lackland Air Force Base. Although several studies are currently underway, and a few have been presented as preliminary data, apparently none have been published since the beginning of Operations Iraqi Freedom and Enduring Freedom.

Preliminary data in a study of gunshot wounds in U.S. military working dogs shows a survival rate of 33% in 21 dogs. Of the surviving dogs, there is a return to duty rate of 71%, with the remaining 29% undergoing continued care and

* Area of concentration

expected to eventually return to full duty. This data also shows that five of the seven dogs that survived their injuries were considered in critical condition at some point in following their injuries, requiring advanced lifesaving care by medics in the field or by veterinarians at the deployed veterinary treatment facilities.[2]

This military working dog incurred a gunshot wound to the head. Following intensive care and treatment for skull fracture, detached retina, and traumatic brain injury, he recovered fully and returned to duty four months after the injury.

An animal care specialist provides postoperative physical therapy to a working dog who had received a gunshot wound to the shoulder. The dog underwent extended physical therapy at the DoD Dog Center at Lackland, Air Force Base, Texas, and returned to full duty.

Currently there is no standardized injury severity score methodology for dogs as there is for human trauma victims. However, classification of canine casualties for these studies is modeled as closely as possible to human studies. The terms killed in action (KIA), died of wounds (DOW), wounded in action (WIA), and disease, nonbattle injury (DNBI) are defined to allow comparison to human morbidity and mortality studies. A dog is considered KIA if it dies prior to reaching care of a veterinarian in a facility capable of resuscitative treatment or surgery. A dog is considered DOW if it arrives at veterinary care as defined above, but subsequently dies of the wounds, or are euthanized because death is imminent. The term WIA indicates the dog ultimately survived its wounds, and DNBI is used for cases of injury or illness not caused by combat action. According to the preliminary ballistic wound data, none of the injured dogs were categorized as DOW; they either died instantly from catastrophic trauma or survived to return to their home station.[2] One study of human combat casualties showed approximately 12% of patients died with injuries which were determined to be potentially survivable.[3] That is, they suffered injuries from which, with proper identification and treatment of those injuries, they could possibly have survived. No canine casualties in the ballistic wound study have been identified in this category.

Wound distribution for these cases does not appear to mirror wound distribution for human combat casualties. For example, wounds to the thorax from any cause (ballistic, explosive, blunt trauma) appear to be more common in canines than in human service members.[3,4] This is probably due to several factors, including the four-footed, head-forward stance of dogs rather than the upright stance of humans, as well as the fact that dogs generally do not wear body armor. While it is commercially available, it is quite heavy, does not carry the same ballistic rating as human body armor, and is thought to contribute to fatigue and heat injury in dogs. The practicality of its use is limited. The U.S. military does not issue body armor to its working dogs, although some improvised or commercially-acquired types have been used in theater.

Explosive injuries and blunt trauma make up the majority of other major combat trauma in dogs.[5] Improvised explosive devices and mortar and rocket attacks have caused injuries in dogs as well, and, anecdotally, such events appear more likely to result in a combined mass casualty event where both human and canine casualties occur.

Integration Of Veterinary Care Into The Human Medical Assets In Theater

As mentioned above, deployed veterinary teams are not specifically equipped, staffed, or trained to manage serious canine trauma cases. Most locations lack diagnostic imaging and comprehensive laboratory equipment, and are minimally staffed with skilled veterinary providers. Integration with human medical resources such as a combat sup-

port hospital, Air Force theater hospital, or other human medical facilities is vital to providing advanced veterinary care to critically injured dogs.

In one notable case, a working dog and several human servicemembers were seriously injured when an improvised explosive device caused a building to collapse, trapping the servicemembers and the dog under the rubble. The dog was placed on the evacuation helicopter along with the injured humans, and taken to the Air Force theater hospital in Balad where they were treated side-by-side in the emergency department. Emergency department personnel were assigned to assist the veterinarian with emergency care of the dog until he could be stabilized and transferred to the veterinary treatment facility adjacent to the hospital. Separating the dog from the handler to go straight to the veterinary treatment facility, while the handler was sent to the hospital would have caused confusion with medical operations within the medical evacuation system, and would have required additional personnel to triage and transport the dog to a separate location. They treated the dog as another combat casualty, and brought the veterinarian into the emergency department as the veterinary provider. This allowed a smoother and more efficient flow in treatment of all of the casualties. In addition, proximity of the dog to an injured handler is important to morale of the team, and calmness of a potentially aggressive working dog.

In another case, a dog suffered multiple fragmentary wounds following a suicide bombing in close proximity to the dog and handler. The dog and handler were taken back to the forward operating base, where they were immediately separated. The handler was taken to the combat support hospital, while the dog was taken straight to the veterinary treatment facility. The veterinary field officer quickly recognized signs of shock and the need for emergency exploratory surgery which she felt was beyond her capabilities and that of her staff in their facility. She immediately transferred the dog back to the hospital where she performed lifesaving spleenectomy and intestinal resection and anastamosis with the assistance of human trauma surgeons, a certified registered nurse anesthetist, and other surgical staff. This action effectively turned Level I veterinary capability into Level III capability at that location without costly addition to veterinary equipment or manpower.

Those are just two cases illustrating how the deployed veterinary teams are adapting to their situation to provide excellent care to dogs with combat trauma. Integration with human medical resources is vital and perhaps should be made doctrinal. Several individual cases have been reported of medical facility commanders refusing to allow dogs treatment in their facilities. An unwarranted and unscientific fear of contamination seems to be the driving cause of this. In reality, there are very few infectious or zoonotic diseases that can be transmitted from dogs to humans, and many of these are mitigated through prophylactic vaccinations (i.e., rabies) and strict prophylactic antibiotic regimens that working dogs undergo while deployed.[6] There has been no formal study in the military sector to support this, but it is likely that working dogs pose no more of a health threat to humans in the medical facility than other humans in that same facility. As long as routine body substance isolation and local decontamination measures are followed, medical facility commanders should not use this as a reason to refuse dogs emergency care in their facilities.

A veterinarian and human trauma team join forces to perform life-saving surgery on a working dog injured by an explosion.

Tactical Canine Combat Casualty Care: Standards Based On Evidence And Combat Data

Tactical combat casualty care for human casualties has well-defined standards of care, as does advanced trauma management, damage control surgery, and critical care. Standards exist for everything from use of tourniquets to use of fluids, blood, and blood products in resuscitation.[7] These standards are based on casualty data and multiple formal studies on actual combat casualties and trauma management in the civilian sector.[8,9] Since there has been no casualty database from which to compile and analyze data for canines, veterinarians in deployed environments have been left to manage these cases based on their own individual experience, "gut feeling," or other available resources.

Similarly, until recently there was no standardized canine first aid training for working dog handlers, and no known

formal military training available for human medical personnel who may be responsible for caring for dogs at the point of injury. Dog handlers and human medical personnel who requested this training from their area's military veterinarian received training based on the comfort level and experience of that individual veterinarian. The reality, unfortunately, was that few veterinarians had been deployed and even fewer had experience with combat trauma. Virtually none had experience with point-of-injury, prehospital care, but were asked to train battle-experienced medics and human medical providers in this area. Add to that the fact that they were training these providers on guidelines that were neither evidence-based nor standardized, and the guidance was often conflicting.

Veterinarians were understandably reluctant to train nonveterinarians on life-saving procedures, such as needle thoracotomy, that they themselves had never performed on an actual patient. However, lessons learned from combat have shown that human medical personnel will improvise when faced with a critically injured dog far from veterinary care, extrapolating from their medical skills. There are multiple cases in which they have performed these lifesaving procedures on injured dogs with good success.[2] Because they will proceed with this care regardless of whether they have received training or not, a new thought is emerging about this training. It may be time to develop evidence-based standards of care that can be used by veterinary personnel as well as the human medical providers who provide prehospital canine care on the battlefield. Recently, Vogelsang's excellent article summarized the basics of military working dog care for human medical providers who may be faced with this situation in deployed locations.[10] This was the only article we could find in the literature to address this concept and it is likely the first of its type, a situation that only emphasizes the need for this type of training and information.

The Way Ahead

The increase in severe combat trauma in dogs has lead to a different way of thinking in the Army Veterinary Corps, and also with human medical providers and units employing dogs on the battlefield. Work is underway to develop a canine injury database similar to the Joint Theater Trauma Registry. Clinical training of junior veterinary officers and enlisted animal care specialists has increased immensely over the last few years, with new interest and focus on management of trauma and critical care transport. Special Operations and flight medic students are given introductory instruction on managing canine emergencies. Several studies are underway regarding combat injuries, morbidity, and mortality of dogs in combat theaters, and of medical evacuation and en route care of working dogs from theater.

Recommendations for continued advancement in this area include creation of doctrine that specifies human medical facilities can be used in treatment of canine casualties, continued recording of canine morbidity and mortality statistics, and integration of brief standardized blocks of instruction for canine casualties in combat medic, flight medic, and other medical provider courses. In addition, prior to deployment, veterinary officers and animal care specialists should be required to gain hands-on training and experience in civilian veterinary emergency and critical care facilities through formal arrangements with veterinary teaching hospitals and veterinary specialty centers.

The area of canine combat trauma management lags behind its human counterpart in resources, standardization, and training, but certainly not in motivation or resourcefulness. Deployed veterinarians have done a fantastic job in adapting to their situation and providing excellent care to injured canine servicemembers.

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Book Reviews

BIOBEHAVIORAL RESILIENCE TO STRESS

Edited by Brian J. Lukey and Victoria Tepe
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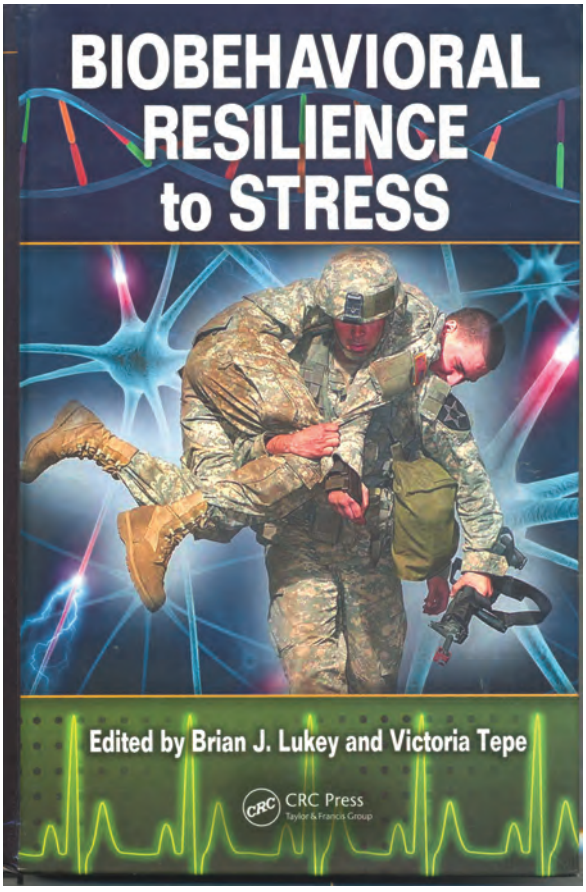
Review by CPT Paul E. Boccio



Biobehavioral Resilience to Stress is an edited text with the stated objective of advancing understanding about factors that effect resilience in performance-critical military operations and to motivate future research into this area. The contributing authors are civilian and military experts in behavioral and social sciences, human performance, and physiology. The text is organized into four sections: (1) stress and resilience in military life, (2) physiology of stress and resilience, (3) psychosocial aspects of resilience, and (4) resilience as an empirical and operational priority. This book provides a comprehensive review of the current literature on resilience and the relevance and application of this construct in military servicemembers. The authors openly acknowledge the need for an operational definition of resilience that encompasses the broad spectrum of this complex construct (psychological, physical, biological) that would facilitate more focused research efforts. The emphasis in this text is placed on the importance of focusing future efforts on a multidisciplinary approach but with special attention on relevant genetic variations and the underlying biological basis of resilience to stress.

One of the main issues highlighted in this text is that additional research in the area of resilience with servicemembers is needed. The U.S. military has been involved in sustained combat operations for almost eight years. The majority of the current literature on servicemembers and the focus of the media have been on the deleterious effects of combat. Recently, a number of mental health professionals have begun to espouse the theory that resilience is the most frequently observed outcome in those who have experienced a potentially traumatic event (PTE). This realization has led to recent research efforts by the American Psychological Association into a phenomenon referred to as "Post Traumatic Growth (PTG)." The concept of PTG allows for the recognition that many people experience positive transformations in their lives as result of their struggle with trauma or major diversity.[1] PTG "goes beyond resilience and involves not only the ability to bounce back but also to grow a little further."

Although resilience has been clearly observed in the SOF warrior community, few published studies have critically examined this construct. The few studies that do exist were reviewed in this text. Morgan III et al. investigated the resilience of Special Forces Soldiers to adjust to stressors and hypothesized that the subjects

examined were able to respond more effectively and return to homeostasis more quickly due to psychoneuroendocrine factors such as neuropeptide Y (NPY).[2, 3]

The SOF community could contribute additional data to this important area of research. For example, the authors reviewed current and future indications for screening and predictive measures of resilience, which could be used to identify characteristics associated with increased risk for attrition from service and experiencing psychological pathology post-deployment. Assessment and selection is an area that the SOF community has focused on as a means to improve training success rates and overall operational effectiveness, in addition to eliminating those candidates, prior to starting training, who do not have the necessary mental, physical, or emotional traits. This process has been shown to be effective through superior operational preparedness and mission effectiveness. A comprehensive and thorough examination of this process could help to elucidate the core elements of this process, which could then be modified to enhance such processes in the non-SOF community.

This reviewer recommends this text to commanders, senior leaders, and military/Veteran Affairs mental health professionals. The strength of this book for the SOF community would be to help encourage additional future research examining biological markers for resilience. In addition, this text provides a framework for future research validating the selection and assessment process and value of realistic and frequent training.

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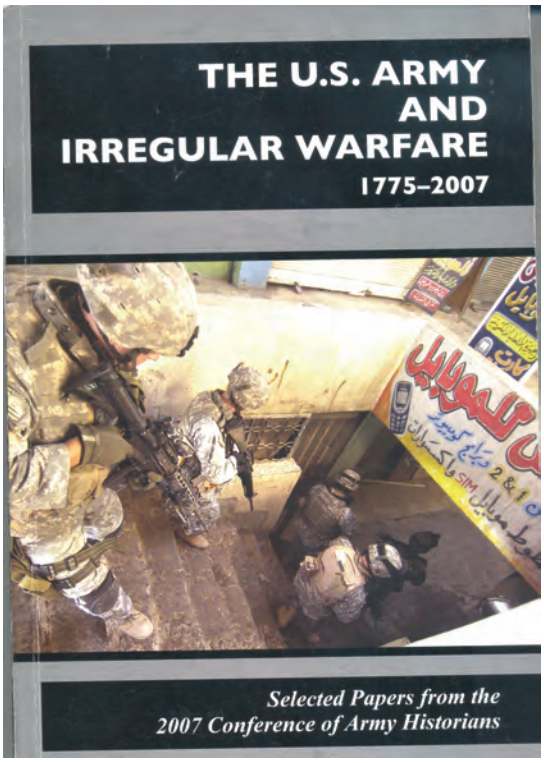
THE U.S. ARMY AND IRREGULAR WARFARE, 1775-2007: SELECTED PAPERS FROM THE 2007 CONFERENCE OF ARMY HISTORIANS

Edited by Richard G. Davis. Center of Military History, United States Army, Washington, DC, 2008

Review by LTC William Bosworth, DVM



The U.S. Army and Irregular Warfare, 1775-2007, is a collection of fifteen historical papers that were gleaned from over sixty formal papers at the 2007 Conference of Army Historians. A portion of the conference examined many aspects of unconventional warfare that are significant to our country's history, from Revolutionary War times to the present day Global War on Terrorism. The papers included in the collection cover irregular warfare under a wide array of circumstances and periods of our nation's history, where Americans have been insurgents, counterinsurgents, or both. They also examine some of our NATO partners' counterinsurgency experiences. One of the notable themes is that no matter how much we believe that our nation has only fought conventional wars, the truth is that America has engaged in irregular warfare since before the founding of our nation. By examining the lessons from these past conflicts, we can apply this knowledge to our current contingency operations throughout the world.

The collection is divided into three parts. The first part has six essays that cover non-American counterinsurgency operations, to include the campaigns of Muhammad, the founder of Islam, and the British counterinsurgency against the colonial rebels during the Revolutionary War. Part two covers special aspects of irregular warfare to include a history of U.S. Army military commissions, and the use of indigenous laborers during the Korean War. Finally, part three covers U.S. counterinsurgency operations from the Indian Wars to the Cold War, and some observations on how American's advise indigenous forces.

In the first part on non-American counterinsurgency operations, the first essay on Muhammad's asymmetric campaigns covers the rise of Muhammad's ideology that developed into modern day Islam, and how he successfully utilized tactics and techniques, many of which are recognizable today, in an insurgency against his much larger and stronger enemies, many of which are recognizable today. The common theme of the remaining five papers in the section is about how the major powers failed to plan for post hostility operations in their campaigns, and how the insurgencies responded. British operations during the American Revolution are covered in two essays that document the failure of the British to conduct an effective phase IV, or post-hostilities, campaign after they had recaptured coastal towns and the interior of the Virginia, Georgia, and South Carolina colonies. The British failure in Georgia and South Carolina started a civil conflict by treating the Rebels too harshly and by failing to guarantee the security of the Loyalist populace. Cornwallis was able to mount an effective counterinsurgency campaign in Virginia, but was recalled to Yorktown before he could defeat the Rebel insurgency. This lack of follow-through wound up costing the British the entire war and the American colonies. In the fourth essay, as part of the British Empire, Canadian forces fought alongside the British during the Boer War in South Africa. The failure to initially recognize the Boer counterinsurgency led to the attrition and withdrawal of Canadian forces in 1901. The British belatedly responded to the Boers by brutal repression and overwhelming force, separating the insurgents from the support they needed to resist British rule. The fifth paper covers the Italian occupation of Ethiopia. Mussolini and his senior leadership gave no thought to how they were going to govern Ethiopia once they had occupied the capitol in 1936. The Italians ruled the country directly, giving

little or no role in governance to the local populace, and alienating the elites, many of whom had not supported the previous regime. This lack of local knowledge and culture lead to the attempted assassination of the Italian viceroy in 1937, which caused the occupiers to crack down on the remaining elites until Word War II broke out in Europe. In the last paper in this section, the author explores three Dutch counterinsurgency campaigns: the successful pacification of the Aceh province in current day Indonesia; the unsuccessful post-WWII attempt to reclaim Indonesia as a Dutch colony; and their current day efforts at counterinsurgency in Afghanistan as part of the NATO force, highlighting their ability to adapt their counterinsurgency doctrine to present day conditions.

The second section looks at special aspects of irregular warfare. The first paper looks at the establishment of military commissions during the Mexican-American War and how they have evolved from the Civil War to the present day Global War on Terrorism. The next two papers look at events of the Civil War. One looks at how the militias of Kentucky were used by its leaders to settle its relationship with the Union during the opening months of the Civil War by not resorting to brutality, as some would have hoped. The second Civil War paper recounts how raids into Harrison County, Indiana, by Confederate Brigadier General John Hunt Morgan, while of little military value, caused long-term political consequences on both sides of the Ohio River. The fourth paper in this section looks at how the U.S. Army used local labor, most of it by hand, during the early part of the Korean War to repair railways damaged by the fighting and retreat of the North Korean forces. It was beneficial to both sides as the Korean laborers were able to repair the key rail infrastructure and maintain their ravaged economy, and it kept them productive, preventing them from causing problems for the United Nations' forces.

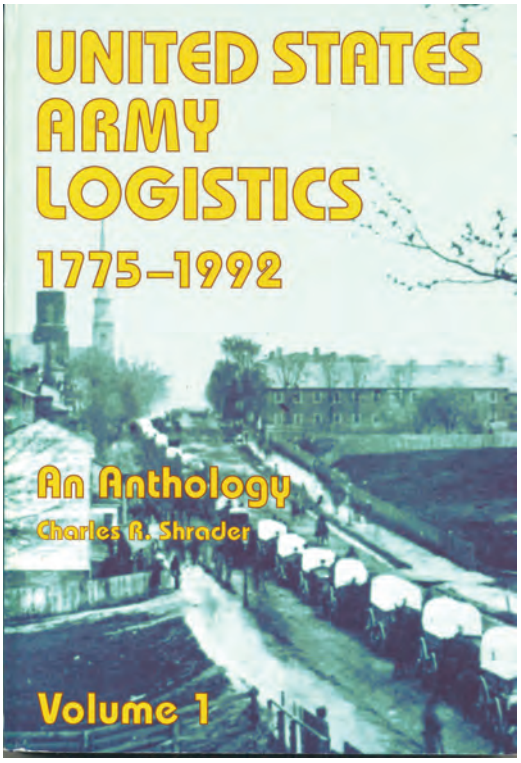
The third section covers U.S. counterinsurgency operations, beginning with the campaign to capture Victorio, a Mimbres Apache who, along with four hundred followers, raided their enemies from their base on the Warm Springs reservation in New Mexico. The U.S. Army's hunt for him is reminiscent of Pershing's hunt for Poncho Villa, and today's hunt for Osama bin Laden in western Pakistan. Victorio was killed in Mexico after his pursuers were able to interdict his ability to get food and water, chasing him and his band into the desert. The next paper recounts how General James Van Fleet was able to rebuild and train the Greek National Army during the post-WWII Greek civil war to defeat the Communist insurgency being supported by the Soviet Union and Josef Tito of Yugoslavia. The next paper covers U.S. Army counterinsurgency operations in Korea after WWII and through the Korean War. As the commander of UN forces, General Van Fleet used his experiences in Greece to rebuild the South Korean army and to conduct division-sized counterinsurgency operations behind the UN lines. The next paper moves to the Vietnam War and describes one unit's efforts at developing up-armored gun trucks to protect convoys moving along the 100-mile long Route 19 in the Central Highlands. The essay parallels many of the actions that have been undertaken to protect convoys in Iraq and Afghanistan by welding steel plates onto the sides of trucks and sandbagging vehicle floors to give added protection from improvises explosive devices (IEDs) and ambushes. The final paper covers advisory efforts by the Army during the Korean and Vietnam wars and the civil war in El Salvador, and the difficulty of finding enough advisors who have the necessary military, cultural, and language skills to train an army to repel an insurgency and to support its leadership.

The papers are all well written and easy to read, although only one, the Victorio campaign, contained maps to follow the progress of the campaign. Many of the other papers would have benefited by having maps of the area showing the campaign to help orient the reader. It was a very enjoyable collection with many lessons that we can apply to our current contingency operations.

United States Army Logistics 1775-1992: An Anthology Volume 1

By LTC Charles R. Shrader

Review by LTC Kevin Cooper



This anthology, and specifically this volume, dedicates 322 pages to detailing the logistical principles, problems, organizational design, and employment of resources beginning with the American Revolution and ending with military operations on the American Frontier of the late-1800s. Two other subsequent volumes relate the same logistical issues/concerns from the Spanish-American War through Desert Storm. Lieutenant Colonel Charles Shrader uses selected manuscripts, essays, and readings to provide a detailed glimpse into numerous military campaigns throughout history, and, in many cases, uses the selections to illustrate the commonality of logistical issues faced by military forces. Of note to the medical community though, upon reading the preface, it is abundantly clear where health service support and the art and science of medical logistics rank in the priority of the 322 pages. As LTC Shrader states up front, "Unfortunately, the limits of space have precluded the inclusion of material dealing with the one remaining area of Army logistics, medical service, or with the important contributions to logistical operations of the Corps of Engineers."

Charles Shrader's selections and references are in most cases focused on the operational and theater level. A strategic focus, though at times discussed, does not play a prominent role in this anthology. As Shrader discusses the logistical relevance of military operations throughout history, it becomes clear that although military operations have evolved into more complex confrontations with increased technology and greater logistical support requirements, supply constraints remain the same. Lines of communication and thus the logistics "tail" of operations require greater infrastructure and supply chain management. Transportation capability is paramount to mission success. Responsiveness and flexibility of the supply system to meet customer requirements are essential. In many cases, the reader may be intrigued by how often logistical problems were repeated in different conflicts to varying degrees.

As mentioned previously, this anthology does not speak to the intricacies or relevance of the "medical services." It is unfortunate that this key area of overall sustainment and logistics support is not addressed. Only once does Shrader make reference to the medical realm, and in doing so uses a humorous reference to the roles and responsibilities of the Quartermaster Sergeant in the British Army of the eighteenth-century:

> *"As you are undertaker-general to the regiment, take particular care, when a soldier dies, to see the external offices of his funeral performed with decency. If any young surgeon should want a body for anatomical purposes, you may safely answer it to your conscience to furnish him. To be cut up and quartered is the least a man can expect, who enlists into the army: and, after he is dead, it is ten to one, he*

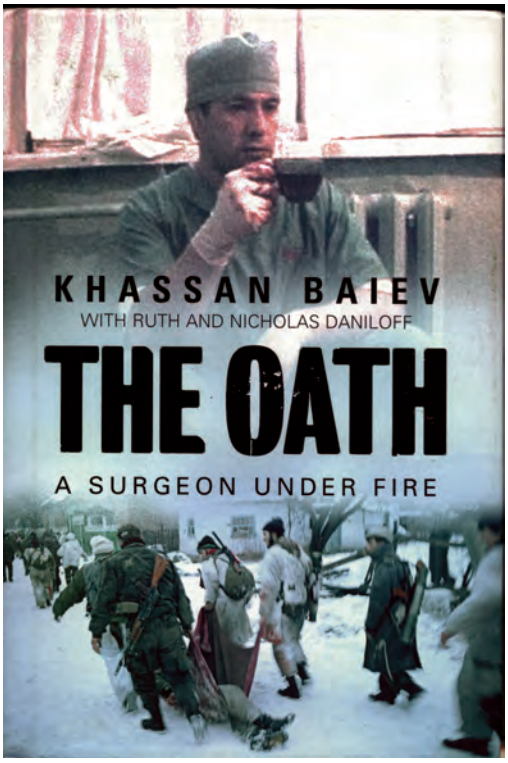
will know nothing of the matter. It will lighten the burden of the supporters, who have fatigue enough without that of carrying dead bodies; and whether you bury a corpse or an empty coffin, it is the same thing to the regiment, and to the person – provided that latter has his fee."

There are two other volumes to this anthology series. Volume 2 addresses the "Era of Specialization" (as Shrader calls it) - that period from the Spanish-American War through World War II. Volume 3 focuses on the "Era of Integration" — that period from the Korean War through Operation Desert Storm. With little to no reference to the realm of medical logistics and combat health service support, the reader misses out on the critical role that healthcare and its associated logistics' requirements play in the overall scheme of sustaining the war fighter. Overall, this is a good read only if you are a truly dedicated logistician.

The Oath
A Surgeon Under Fire

Khassan Baiev
Walker and Company; 1st Edition. New York, NY. 2003, hardback. 376 pages. ISBN 0-8027-1404-8

Review by MAJ G.W. Horsley



The Oath is a memoir written by Dr. Khassan Baiev, a dental surgeon detailing his life both as a Chechen and as a surgeon. The title probably refers to the Hippocratic Oath that Dr. Baiev took upon his graduation from the Krasnoyarsk Medical Institute. It was his interpretation of the Hippocratic Oath that provided the framework with which he approached his patients during both of the Russo-Chechen Wars. It was his steadfast adherence to this oath that endangered his life and ultimately required his emigration to the United States of America.

This book is written in five parts. Though the vast majority of the book is about the author's exploits while performing as a surgeon in war-torn Chechnya, a significant portion of it also encompasses recollections of his childhood through his graduation from the Krasnoyarsk Medical Institute. This additional background provides the reader with a good primer on Chechen history, and its place in the greater Soviet and post-Soviet society.

Dr. Baiev graduated from the Krasnoyarsk Medical Institute as a dental surgeon. He quickly began to have success as a reconstructive surgeon in Moscow. When the rumors of war in Chechnya reached Dr. Baiev, he decided to return home to Chechnya. Many people, including his family, urged him to remain safely in Moscow, but Dr Baiev felt it was his duty as a Chechen to provide assistance to his people.

Upon his return to Chechnya, the story turns into a tale of great personal sacrifice with descriptions of the horrors of day-to-day survival within Grozny. He expounds upon his trials and tribulations, during his attempt to provide care to as many people as possible , all the while trying to stay alive himself. To Dr. Baiev, "a patient was a patient." It made no difference to him if the patient was a civilian, a Chechen fighter, or a Russian soldier. This attitude would make him unpopular and ultimately cause him to be hunted by both the Chechens and the Russians.

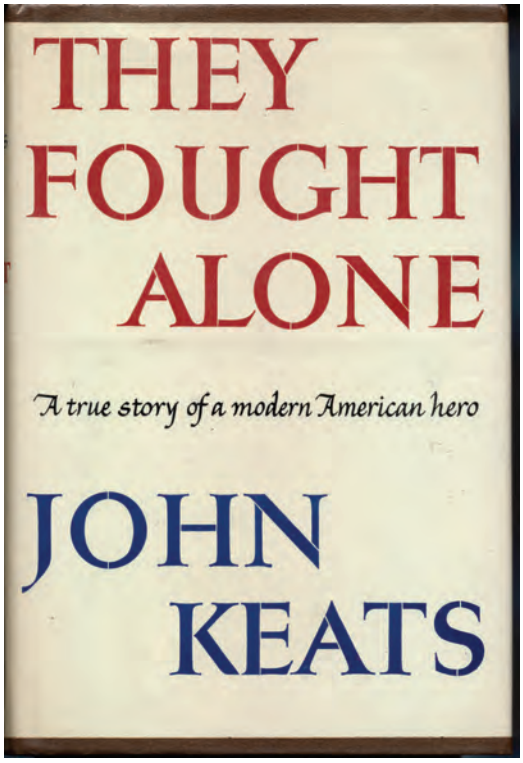
The Oath was enlightening for me because like many other Americans, I had no real understanding of the Chechen Republic or the history or events that led to the wars. Additionally, I had no understanding of how different the two wars were from each other; not only different in their causes, but also in how they were each conducted. Although the following point was never overtly made by the author, I was struck by the polarly opposite ways in which the Russians and the U.S. have approached recent wars with Muslim populations. The complete disengagement of the Russian military from the Chechen community has created a young population with no cultural underpinnings, who believe that they have nothing to lose. This population has in turn become the fighters of today (and tomorrow) with no real understanding of the purpose of the war, or else their understanding has become perverted by outside influences. Unfortunately, the author only touches on the Saudi Wahhabists who frequented Chechnya after the first war, and he categorically denies that Chechens gave these Wahhabists any consideration, but the attack on the Beslan Middle School would probably not have been considered by the leadership of the first war.

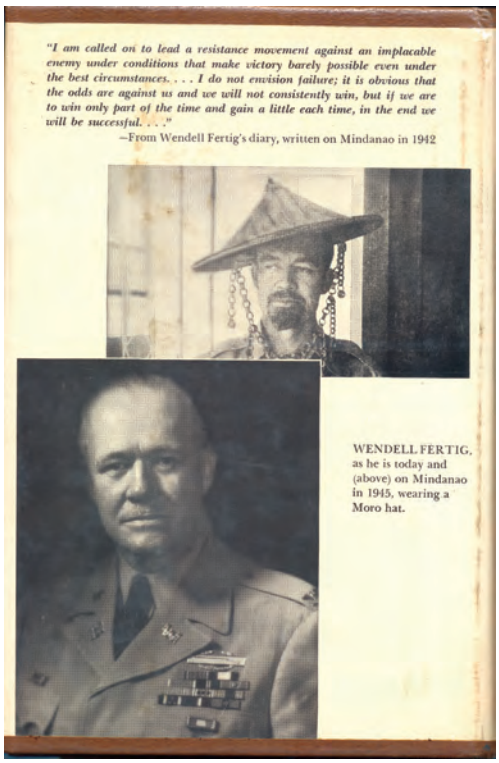
Overall, this book provides the reader with a better overall understanding of Chechnya, its people, and its history. It is also a good "triumph of the human spirit" type book. However, in these busy days for those in SOF medicine, during which time is such a precious commodity, a quick review of the internet could provide the same primer on Chechnya in just a few minutes. This book has little to offer the professional man at arms and is better left to others to read.

They Fought Alone
A True Story of a modern American Hero

John Keats
J.B. Lippincott Company, Philadelphia and New York, 1963. Hardcover, 425 pages.

Review by LCDR Joe Patterson





Published in 1963, *They Fought Alone* outlines the U.S. Army Corps of Engineers LTC Wendell Fertig's rise to power as the U.S. guerilla leader in Mindanao, Philippines during World War II. As with several other Americans who refused their order to surrender, or else escaped from captivity, LTC Fertig found himself alone and on the run following the fall of Corregidor. What made Fertig different was his drive to establish civil control, and unify the chaotic and poorly-armed effort to disrupt Japanese operations in the area.

They Fought Alone reads more like a novel, rather than a dry recollection of historical facts. Unfortunately, this also makes it easy to get sidetracked and miss the real point of the book. There is the story of his initial desperate foray into the mountains with only a team of young boys to carry his gear, and a guide he kept on a leash and collar. The author, John Keats, discusses how Fertig rationalized promoting himself to brigadier general and continually describes the harsh living conditions including food shortages, tropical diseases, and Japanese mistreatment of local civilians and POWs. Every page seems to contain a colorful account of some person or event; however, look past these stories, and the real value of *They Fought Alone* is in its discussion of unconventional warfare (UW).

Using principles that are still pertinent today, the self-frocked BG Fertig navigates his way in a non-Western culture by leveraging his cultural background as a pre-war mining engineer in the Philippines. BG Fertig considers how his decisions will affect the Christians, the Muslim Moro, the Negrito mountain people, the city dwellers, the fishermen, the other displaced Americans, and the Japanese too. He considers the expectations among these groups with regard to leadership, loyalties, sex, wealth, trade, and conflict. How does he translate detached U.S. directed actions into local success? What will be the primary, secondary, and tertiary effects of these actions? As most of you know, these second- and

third-order effects are something any commander involved in insurgency should take into consideration.

The author relays the information colorfully and sweats the details to tell the story. Is it 100% accurate in its novel-like detail? It is hard to tell, and this is one of the questions which historians of guerilla warfare (GW) have debated since the book was first published. Ultimately, Fertig effectively commanded a large and diverse guerilla army while administering an underground civil government in Mindanao. Furthering the controversy was that he was not allowed to keep his rank of brigadier general after the war, but instead retired as O6 in the Corps of Engineers. His experiences did, however, earn him a place at the Pentagon table for those with guerilla warfare knowledge, and he apparently helped with initial building of the Army's (later named the JFK) Special Warfare Center. This is a very worthy read for those interested in GW, the Pacific Theater in WWII, or leadership in general. Unfortunately, this book is out of print, but the 46-year-old collectable tome may be found at the library, or you can buy it online for prices between $35-$395.

Editor's Note: (From one of our editorial reviewers) I think this book should be required reading for all SOF E-7s on up, if they work with foreign troops at all. Interestingly enough, it turns out that COL Fertig's grandson is now a MAJ in the 5th Psyops at Ft Bragg.

The Air Force Role in Low-Intensity Conflict

David J. Dean, LtCol, USAF

Review by Capt Keith Vollenweider

This book, *The Air Force Role in Low-Intensity Conflict*, lays out a vision of how air power can address low-intensity conflicts by developing the techniques and structure of what eventually became Air Force Special Operations Command (AFSOC). It was published in 1986, four years before the stand up of AFSOC, but after the USAF had gained considerable experience in low-intensity conflicts with the Special Air Warfare Center (SAWC) of the early 1960s. Beginning by defining low-intensity conflict and how the conventional air and ground forces at the time planned (or didn't plan) for it, the author, Lt Col David Dean, is very insightful in predicting how wars of the future are not likely to resemble the conventional model of large massed forces that had been seen in WWII and had been envisioned by many to be the most likely threat facing the near future of the U.S. military.

Col Dean continues by looking at British and Moroccan Air Forces experiences in using air power to deal with low-intensity conflict, first in British Iraq in the 1920s and 30s, with the RAF's development of "air control" as a means of controlling insurgent or rebel forces and the associated civilian populations in the affected regions. He next looks at Morocco's long conflict with the Polisario Front, an indigenous force fighting for independence in western Sahara. This second conflict is discussed extensively, beginning with a short history lesson on the background of the conflict and the parties involved. Discussed are the force structure of the Moroccan military and more specifically the Royal Moroccan Air Force, and its foe, the forces of the Polisario in the disputed region; as well as political, diplomatic, economic, and social factors affecting the conflict.

After looking at the experiences of these two foreign conflicts, Col Dean looks at the USAF involvement in the Vietnam War and specifically how SAWC played a part in the early stages. Based on these historical experiences, Col Dean suggests three areas for future U.S. military involvement in low-intensity conflict. First is assistance through training and sales of military equipment, next is integration through advice and minimal participation of U.S. forces in the conflict, and last is intervention by direct U.S. action. The book finishes by discussing how SAWC should be reconstituted to give the USAF capabilities needed in low-intensity conflicts. This was in-effect accomplished by the creation of AFSOC in 1990.

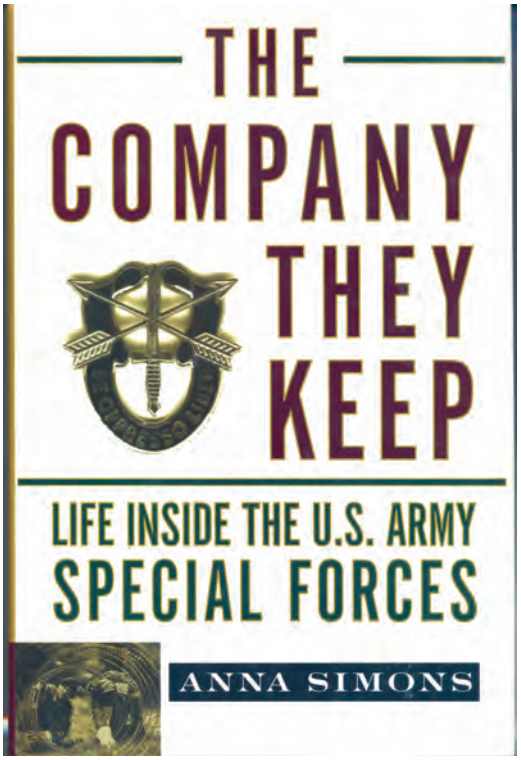
If you are looking for a book on air power in special operations that is current and up to date, then this is probably not for you; but if you would like to see how other militaries have used air power to deal with low-intensity conflict, and you don't mind some references to future conflicts with the Soviets and their allies, then this could be worth a few hours of your time (it's less than 130 pages long). It doesn't hurt if you have an interest in North Africa, as the section on the Moroccan/ Polisario conflict is likely to be new information to the average U.S. military reader. The fact that the section on the SAWC is predictive of the formation of our current AFSOC is another bonus.

Overall, this book is worth the read if you have specialized interest in this subject area.

THE COMPANY THEY KEEP: LIFE INSIDE THE U.S. ARMY SPECIAL FORCES

Anna Simons. New York: The Free Press. 1997. ISBN: 0-684-82816-2.

Review by LTC Craig A. Myatt



In a compelling anthropological approach to detailing the life and times of U.S. Army Special Forces (SF) training, Anna Simons provides images of a world few ever experience. For those who do experience SF training, according to Simons, the training is arduous, yet worth it. Simons enters the world of an elite group of Soldiers who train, live, and uphold the highest virtues of the modern-day warrior. Focusing heavily on the social aspects of SF training and lifestyle, Simons displays an uncanny ability to expose the core attributes of the elite warrior… unlike many of her contemporaries.

From field training exercises to individual interviews with Soldiers and their families, Simons displays some of the inner thoughts of Soldiers training and living within a SF unit. Team functionality is what most impresses the author, and she makes an effective presentation of how most teams perform under ordinary circumstances and under extreme stress. Effective teams train effectively. They train, train, and train some more. Simons demonstrates that an increased frequency of training does not, in any way, diminish the dangers of training. In fact, she skillfully helps the reader appreciate that SF is unique, partly due to the risks that the Soldiers face not only in operations, but also in training.

Simons shows that each member of a SF unit must be able to work independently as much as within a team. Legends of the warrior who dons the "green beret" are typically legends of survival in extremely dangerous situations. Survival in the elite SF warrior is built within the framework of the most effective and unique military organization in the world. In Simons' account, the human dimensions of the SF warrior uphold a military tradition of commitment to excellence and high achievement.

The Company They Keep is ideally suited for the reader who wants to join SF. It is especially useful reading to one who may not have a clear perspective on day-to-day SF functions. For example, the novice potentially en route to the SF "Q-Course" would likely find Simons' discourse

on the unique qualifications for graduation, and the right to wear the SF tab, as an excellent preparatory indulgence. With the eye of a neo-Darwinian anthropologist, Simons observes and describes the poor Q-Course candidate, distinguishing him by mechanisms of "natural" selection from the successful candidate. The poor candidate is by no means weak, just not fit to make it in accordance with natural laws governing modern warrior selection. Anthropologically for Simons, an inability to thrive individually can spell failure for a Q-Course candidate as resoundingly so as do any social interpersonal shortcomings.

Through each phase of the Q-Course, the successful candidate exceeds his neo-Darwinian limitations. Theoretical presumptions on goodness-of-fit are ultimately dismissed or altered. Simons presents the successful candidate as more protean in nature. He is perhaps naturally no more a good fit for survival than the poor candidate, yet he distinguishes himself from the poor candidate in his learned ability to study his own individual limitations, and to acknowledge them.

Common sensibilities to the SF warrior render an acceptance of theory altered in practice from an unconventional standpoint. Such sensibilities, though loosely defined by Simons, make the successful Q-Course graduate better prepared for unconventional warfare. Training for unconventional warfare is what distinguishes the Special Forces warrior from the conventional warrior. As Simons states, "SF is about training, training to train, and training to train others."

After the Q-Course, the SF warrior can undergo additional training on unconventional warfare by completing survival, evasion, resistance, and escape (SERE) school, other sorts of operational training, and a myriad of language courses. He can also train others. Sensibilities acquired for unconventional warfare are preserved by the integrity and unwavering commitment of the SF warrior to train and deploy. The lifestyle of the SF warrior is difficult and exciting. Though few truly know the world of the SF warrior, Simons unveils aspects of life inside the U.S. Army SF that are noteworthy and entertainingly candid. I recommend this work for aspiring SF warriors and Special Operations Forces (SOF) enablers with little SOF experience.

From the Command Surgeon

WARNER D. "Rocky" FARR
COL, U.S. ARMY
Command Surgeon
HQ USSOCOM

As I write this in mid-April 2009, much has changed and/or progressed along here at headquarters. We just had the annual Joint Special Operations University's (JSOU) medical course, the Joint Special Operations Medical Orientation Course, which went very well and was the largest class ever. The new medical chair at the JSOU, Lt Col Mike Taylor, USAF, MSC, is doing a great job and the course was not only bigger than ever, but was much more focused on medical support to the warfighters. All the Theater Special Operations Command (TSOC) Surgeons from each geographic combatant command (GCC) were here to brief along with the SOF Component Surgeons. The last TSOC surgeon came on board in December so many are quite new and we had a lot to talk about.

We also just had a USSOCOM Surgeons' meeting and a Biomedical Initiatives Steering Committee (BISC) meeting. During all this, USSOCOM also hosted the first ever SOF Command Psychologists' meeting. My (SOCOM) psychologists, LTC Myatt and CPT Boccio, are pulling together a coherent command program for the boss that addresses stress hardiness and resilience in both our force and their families. It was a really busy week. This was a nice balance to the SOMA wintertime get-together.

Most of you know that I have spent a fair amount of time in the three years that I have been here in getting the billets, and filling the slots after I got them, for TSOC Surgeons. The senior SOF surgeons, medical service corps (MSC) officers, and senior medical noncommissioned officers in those sections will enable the TSOC Commanders to have a Command Surgeon section to make smart medical decisions and plans.

Interestingly enough, I am PCSing 1 JUL 09 to be the SOCCENT Surgeon. So rather than continuing to preach on "how we need TSOC Surgeons" and "what they out there in the GCCs need to do" (from my comfortable Tampa foxhole), I now will have to walk the walk! Cannot wait! Additionally, my successor has already been named – COL Tom Deal, MC, USA, from USASOC. ADM Olson made a great choice and I feel good about turning all the initiatives, both done and undone, to Tom.

Our medical acquisition program continues moving forward and is fielding the SOF-specific items our medics and Operators need. A comment on that issue; we follow Tactical Combat Casualty Care (TCCC) guidelines and I sit on the committee, chaired by my predecessor, CAPT Frank Butler, USN (Ret). We have always practiced way above TCCC guidelines and that's why we are equipping and training in excess of TCCC guidelines. Consider TCCC requirements / standards to be THE MINIMUM and what we "train, organize, and equip" to, in addition, *above* TCCC, is OUR standard. As TCCC has now been adopted by all of the Services, certain Service agendas are entering into the guidelines – we should not care. We are SOF! We set our own rules! Higher!

I set four goals when I got here from USASOC:

1. Stand up a SOF-specific medical acquisition program to level the SOF medical playing field for all units, regardless of component, mission, or internal resourcing level, and to enforce the interoperable standard through equipping to that standard.
2. Continue to mature the Advanced Tactical Practitioner (ATP) card and program and get it fully funded in the POM FY 2010-2015.
3. Develop and resource TSOC Surgeons in each GCC.
4. Grow Level-2, forward surgery capability.

So, y'all be the judge on how I've done. Here's my own self-assessment:

1. TCCC Acquisition Program — Block 1 done, block 2 ongoing, block 3 in the works.
2. ATP card — gaining wider acceptance; fully funded by the command in POM 10-15.
3. TSOC Surgeons — in place.
4. Level 2 — I brief it again tomorrow to the decision makers.

I think I am about done. So, I am taking Dari language classes, sewing new flashes on berets, and looking forward to working for MG Cleveland again! Thanks to all, both in my office, and outside my office who have helped me do what successes I have done. Any shortfalls are my responsibility alone.

See you at SOMA! *De Oppressor Liber*.

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
1200 DEFENSE PENTAGON
WASHINGTON, DC 20301-1200

HEALTH AFFAIRS

ACTION MEMO

FOR: ASSISTANT SECRETARY OF DEFENSE (HEALTH AFFAIRS)

FROM: Ms. Ellen P. Embrey, Deputy Assistant Secretary of Defense (Force Health Protection and Readiness Programs) (//s/1/6/09)

SUBJECT: Tactical Combat Casualty Care

- Tactical Combat Casualty Care (TCCC) trauma management guidelines are specifically designed for use in the pre-hospital battlefield environment. Multiple published reports have documented TCCC usefulness on the battlefield. The Committee on Tactical Combat Casualty Care provided an Executive Briefing Sheet at TAB B.
- The TCCC guidelines were updated last year based on the recommendations of the Committee on TCCC, a sub-panel of the Defense Health Board, regarding tourniquet use, hemostatic agents, and documentation of care rendered by first responders on the battlefield.
- The updated TCCC training curriculum, which includes Microsoft Powerpoint presentations, training videos, and skill sheets, is posted on both the Military Health System and the U.S. Army Institute of Surgical Research web sites.
- The memorandum at TAB A requests the Services to review these presentations and use this material for training combat medical personnel in TCCC.

RECOMMENDATION: That ASD (HA) sign the memorandum at TAB A.

COORDINATION: TAB C

Attachments:
As stated

Prepared By: COL Tony Carter, FHP&RP, (703) 578-2674, Livelink # 162051, 162052

THE ASSISTANT SECRETARY OF DEFENSE

1200 DEFENSE PENTAGON
WASHINGTON, DC 20301-1200

HEALTH AFFAIRS

MAR - 4 2009

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY
(MANPOWER AND RESERVE AFFAIRS)
ASSISTANT SECRETARY OF THE NAVY
(MANPOWER AND RESERVE AFFAIRS)
ASSISTANT SECRETARY OF THE AIR FORCE
(MANPOWER AND RESERVE AFFAIRS)
DIRECTOR OF THE JOINT STAFF

SUBJECT: Tactical Combat Casualty Care

Tactical Combat Casualty Care (TCCC) trauma management guidelines are specifically designed for use in the pre-hospital battlefield environment. Multiple published reports have documented the usefulness of TCCC on the battlefield.

The TCCC guidelines were updated last year based on the recommended changes from the Committee on TCCC, a sub-panel of the Defense Health Board, regarding tourniquet use, hemostatic agents, and documentation of care rendered by first responders on the battlefield. The recommendations were based on review of pre-hospital trauma literature, direct input from experienced combat medical personnel, and research conducted at military medical research laboratories. These changes will be published next year in the Seventh Edition of the Pre-hospital Trauma Life Support Manual, which will carry the endorsement of the American College of Surgeons Committee on Trauma and the National Association of Emergency Medical Technicians.

The updated TCCC training curriculum (attached), which includes Microsoft PowerPoint presentations, training videos, and skill sheets, is posted on the Web sites of the Military Health System and the U.S. Army Institute of Surgical Research. Please have your medical departments review this material for use when training your combat medical personnel on TCCC.

Differences in training and medical logistics may require some modification to TCCC guidelines at the Service level. Please coordinate any modification with my point of contact for this action, Colonel Tony Carter, who may be reached at (703) 578-2674, Tony.Carter@tma.osd.mil.

S. Ward Casscells, MD

Attachment:
As stated

COMPONENT SURGEON

USASOC

Virgil Deal, MD
COL, USA
Command Surgeon

Greetings from the Piney Woods. As we begin this year's Pollen Festival a fair amount of work is shaping up in the USASOC lane. Our efforts with the Civil Affairs BDE leadership here are moving rapidly toward the transition of our 68WW1 and W4 CA folks into a 38B series MOS, essentially a "CA Medic for Life" plan, that will be more focused on the specific challenges in some of the nation building missions that we're facing today. Likewise, we hope that an FDU from 4th Psychological Operations Group will be able to soon create a Surgeon's cell for their needs.

The last few years have invited our attentions more than once to infectious disease issues; whether they are those of emerging resistance in old friends like *Staph a*. or *Acinetobacter b.,* or outbreaks of febrile illnesses in Africa. We're trying to stay current on those problems and have added an environmental science officer to our Force Protection offices. We are turning out a weekly Exsum on what's current; if you're not on the e-mailing list for this and would like to be, let us know.

Interest and research efforts continue to probe further on diagnosis of brain injury from blast or concussive injury and PTSD. We anticipate hearing something soon from some research on biomarkers for PTSD. Efforts to better quantitate acute and cumulative are likewise proceeding. A number of USASOC personnel have already begun testing using ImPACT, and a smaller number are using ANAM. Both are neurocognitive assessment tools, but we believe that we should be able to get ImPACT funded and fielded for all of our units in short order.

COL Benson's good efforts have paid off in developing a great memorandum of understanding that should allow you to attach your wounded warriors to your installation's Warrior Transition Unit for medical services only, as you and your chain of command see fit. Please let us know if you hit any snags along the way.

These are great times to be a part of the SOF medical team! I don't think that we've ever been able to as effectively look after our folks as we do today. Thanks for all that each and every one of you is doing in today's fight.

COMPONENT SURGEON

AFSOC

Bart Iddins, MD
Col, USAF
Command Surgeon

The previous edition summarily outlined the Air Force Special Operations Command (AFSOC) Surgeon's priorities. This current article, as well as those to follow, will further elaborate upon each priority and will provide more granularity of details and timelines – to include status updates. Since the submission of the previous article, substantial progress has been made on all ten priorities; however, this current writing will focus on the following priorities:

Priority 1: Improve joint medical interoperability with other U.S. Special Operations Command (USSOCOM) medical assets.

Priority 2: Develop, validate, and incorporate an AFSOC medical training pipeline; then embed this medical training pipeline within the Air Force Special Operations Training Center (AFSOTC).

Priority 3: Review current worldwide laydown of AFSOC medical assets.

One of the distinguishing characteristics of SOF is joint interoperability. The importance of this concept was one of many lessons learned as a result of the failed U.S. hostage rescue attempt during Operation EAGLE CLAW – DESERT ONE. Consequently, our number one priority is to *Improve Joint Medical Interoperability*. Furthermore, all other AFSOC Surgeon priorities are at least in part based upon this primary goal. While it is clear that USSOCOM and its components have made impressive progress in this realm since that unfortunate operation, the work never ends. Achieving and maintaining a high level of joint interoperability must always be viewed as a work in progress. Our Special Operations Forces (SOF) medical personnel are no exception and must constantly strive to improve their roles in joint medical interoperability. As evidence of this effort, numerous individual initiatives have been launched which build upon this key foundation. Arguably the fundamental building blocks to joint interoperability are training, doctrine, tactics, techniques, and procedures. Thus, the second priority to *develop, validate, and incorporate an AFSOC medical training pipeline; then embed this medical training pipeline within the AFSOTC*, directly supports joint interoperability.

In the past, AFSOC operational medics arrived at their AFSOC duty station without having first received SOF-specific training. Compromised from the start, new medical personnel were operationally unprepared to accomplish the mission, were not deployable, and received required training in a disjointed, inconsistent manner. Additionally, training levels varied between AFSOC units, especially in regards to tactical field training. As a result, the creation of an integrated, standardized, sustainable AFSOC medical training pipeline has historically been a longstanding goal. Previous attempts, however, were met with only limited success due to the absence of a training organization with the scope and mandate to directly oversee and administer AFSOC's medical training. Fortunately, this all changed with the creation of the AFSOTC, which has the organizational structure and mandate to manage AFSOC's training needs. The AFSOC surgeon's action officers, Col Claudia Giesecke and Maj Bobby Christopher, are working closely with the AFSOTC commander, Col Paul Harmon, to develop and execute an integrated and sustainable AFSOC medical training pipeline.

By summer 2009, newly assigned AFSOC medical personnel will report to AFSOTC for required training prior to commencement of duties at their unit of assignment. The training curricula have been customized for each duty position, but various modules will be common to all AFSOC operational medical personnel, i.e., tactical field operations, survival, evasion, resistance and escape (SERE) training, etc. Furthermore, all AFSOC operational medical personnel will be trained to standards as defined by U.S. Air Force, AFSOC, and USSOCOM requirements.

The third priority, which is to *review the current worldwide laydown of AFSOC medical assets*, is nearly complete. This comprehensive review is being conducted in a brutally honest and objective manner. Results thus far indicate that AFSOC's medical force posture and medical force laydown are close to optimal. However, it is clear that there is a definite requirement to forward base SOF surgical and critical care evacuation assets in order to optimize support of Theater Special Operations Commands (TSOCs). Accordingly, AFSOC is in the midst of moving a Special Operations Surgical Team (SOST) and Special Operations Critical Care Evacuation Team (SOCCET) to Europe. Additionally, AFSOC is working with USSOCOM and Special Operations Command, Pacific (SOCPAC) regarding the possibility of forward basing a SOST/SOCCET in the Pacific. Despite the fact that AFSOC's review of its medical force worldwide laydown is nearing completion, the task will remain open and ongoing. In other words, in light of rapidly evolving and rapidly changing mission requirements, the AFSOC Surgeon and staff will reassess AFSOC's medical force posture and medical force laydown deliberately and continuously.

In conclusion, all AFSOC medical priorities are intertwined, mutually supportive, and undergoing simultaneous execution. Successful execution will improve joint interoperability, overall capability, and the ability to immediately adapt and respond to emerging or changing threats and global challenges.

COMPONENT SURGEON

NAVSPECWARCOM

Lanny Boswell, PT, PhD
CDR, USN
Deputy Command Surgeon

"Train like you fight and you will bleed less in war." Our SEAL medics and Navy corpsmen are testing this principle, along with their skills, as they support our shipmates and other service members in the fighting across Iraq, Afghanistan, and the Philippines. We have received reports on the successes of our training efforts (as well as the "I wish I had"), but through it all everyone has stayed diligently committed and lives have been saved. Because missions are still classified, I will not praise individual performances in this article, but we are very proud of all of the work that Naval Special Warfare (NSW) medics have performed. Those of you forward know who you are, and I thank you again for your service and dedication to your profession and your SOF shipmates.

I am nearing the end of my tour as the Navy Component Deputy Surgeon. Within a few months I will begin another tour, perhaps back with the Navy but more probably another joint command. I know my successor will feel as I have felt – fortunate and honored – to have had the opportunity to serve an amazing community with an extremely difficult mission. I must confess that any sense of accomplishment I have had over the last three years, pales in comparison to the achievements of our medical Operators and command staff.

As with any staff job, the last three years have held many frustrations and wrangling with resource acquisition, policy, and organizational development. We have seen the transition of the SEAL corpsman and the stand-up of the SEAL medic. We have witnessed the ebb and flow of support from big Navy to our expeditionary mission. We advanced the development of Level II and Expeditionary Resuscitative Surgical System (ERSS) capabilities, and increased available support for our warfighters and their families. And more recently, we have even seen recognition from other warfighting Navy communities that Special Warfare is at the tip of the spear in this long enduring war on many fronts. Through it all, our medics and corpsmen are continually thrust into combat operations in the multiple theaters, which we are sustaining throughout the world. The combination of their quick response to secure the wounded, provide resuscitation on-scene, and give sophisticated care during transport-by-air to forward surgical teams or combat support hospitals where early "damage-control" surgery saves lives, is a repeated success over and over again.

I have been asked many times, what makes Special Warfare medicine so effective and successful in its combat mission? Is it the high-tech equipment? Is it an abundance of resources? While it is indeed part of our job to continually analyze this and try to improve it, my answer inevitably is the same, "It's the people … it's always the people." If you select the right people, give them the best training and equipment possible, and then empower them to go out and make decisions and perform the tasks they have been trained to do, they will always be successful. Every medic and corpsman I know in this community has been our best advertisement for what can be achieved and what is possible in the most difficult of environments.

The lesson is clear: train the best, let them do their job, and the opportunities will flow. I can leave here knowing that the future will be challenging and exhausting, but the possibilities are unlimited in serving the warfighter and their families and supporting the nation's defense. I'm lucky to have been a part of it.

COMPONENT SURGEON

MARSOC

Stephen F. McCartney, MD
CAPT, USN
Command Surgeon

It is with mixed feelings that I write my last MARSOC Component Surgeon entry for JSOM. As mentioned in the last issue, I surmised that some senior Navy medical officer was being entertained by our Flag leadership to take the helm here at MARSOC. The selection was made just recently and I could not have been more pleased as it was the one Navy Captain I felt to be a perfect replacement for me. Welcome CAPT Anthony "Tony" Griffay, MC, U.S. Navy. Tony is an experienced emergency physician and currently Department Head of Emergency Medicine at Naval Hospital, Jacksonville, Florida. He has multiple 2008 deployments in OIF and recently returned to active duty from selected reserve status with the 25th Marines. Of delight to all I am sure, CAPT Griffay is a former Special Forces Medical Sergeant. He left the Army and attended medical school at the University of Southern California. I'll let him fill in the blanks when you all meet him. Welcome aboard, Tony. I have the utmost confidence that he will lead MARSOC Medical as our car "continues to speed at 60 mph while still being painted."

I will assume duties as 2nd Marine Expeditionary Brigade Surgeon on 1 April and will be deployed to OEF-A when this issue reaches you. I am told I will still receive the JSOM, so I look forward to keeping abreast of USSOCOM Medicine. A hearty "Hooo ah!" to COL Tom Deal, MC, USA, as you step into Rocky Farr's immense shoes and legacy. Thanks to you both for the stellar advice, assistance, and support, as well as, great friendship during my three years as the MARSOC Surgeon. Also, special thanks to the USSOCOM/SG staff of Lt Col Michelle Landers, NC, USAFR, LCDR Joe Patterson, MSC, USN, HMCM Glenn Mercer (SEAL) USN, and Bob Clayton.

As I depart, MARSOC is a month away from graduating its first class of Marines from our Individual Training Course (ITC). What makes this rather unique is that we have, since 2006, launched more than thirty successful missions, both direct and indirect profiles, having never had a graduate of the ITC. We have suffered sad losses as well. In time, most all will see that Marines in MARSOC do not transform after ITC, but merely are able to better excel at being a SOF Marine.

I believe the Secretary of Defense knew this was emblematic of the Marine Corps when he announced the creation of MARSOC as a new component of USSOCOM back in November 2005. Now in our third year, MARSOC's record speaks for itself, but what is often quoted here explains it best: "Marines are who we are … SOF is what we do." I don't think MARSOC will ever be confused with other SOF.

At the three year mark, MARSOC Medical has nearly filled its original T/O and we are working to grow larger as we reorganize to meet future missions. Gratefully, the JSOMTC has nearly tripled the seats available for Navy students. We are deeply engaged with the Navy and Marine training commands to expand and accelerate pipeline training to fill those seats, and meet the need for more SOCM and SOCM IDC graduates (NEC 8427 and 8403, respectively). In early 2010, MARSOC's address

will change from the historic Navy Hospital Bldg, known as "H-1," to our permanent MARSOC Headquarters out at Stone Bay. MARSOC Medical will be headquartered there and will have a state of the art Aid Station with all of the MARSOC elements, including medical teams being "behind the wire." MARSOC's entire complement of medical officers is eight. Six of us will have likely left by the time this edition hits the street so you all will be meeting new MARSOC faces at the upcoming JSOMOOC and SOMA meetings. I am sure they will enjoy the SOF medical community as much as I have. Most of us come from non-SOF backgrounds and the learning curve is challenging. My anxieties upon arriving to MARSOC from III MEF in Okinawa dissipated quickly as I travelled to USSOCOM, met COL Farr, and enjoyed margaritas with him!

I will close with thanks to you all for welcoming MARSOC Medical, helping us grow, and being our brothers in arms!

I am secure in the fact that MARSOC's second surgeon is the right man – with the right background – for the right job, and will soon discover as I did that "our biggest strengths … were our perceived weaknesses."

TSOC SURGEON

SOCAFRICA

Ricardo Ong, MD
LTC, USA
Command Surgeon

After departing SOCCENT in mid-December, spending my last four weeks in Colorado Springs, I finally made it out to Germany to get started with SOCAFRICA. The fledgling Command is still going through growing pains as we continue to build the systems and processes to function effectively. SOCEUR remains heavily involved and 1 October remains the day for full operational capability. Regardless, the surgeon section is working diligently to establish our systems and SOPs to conduct both medical operations/planning and clinical support operations.

The most significant project I have inherited is the transition of JSOTF-TS from SOCEUR to SOCAFRICA. Although official transfer of C2 remains elusive, I am working with the SOCEUR Surgeon, LTC Rusty Rowe, in transferring the medical responsibilities in preparation for the formal C2 change. The other major project I've stepped into is the ongoing effort by the SOCCE-HOA Surgeon (COL Mouri) to develop a center of excellence for resuscitative surgery and tactical operational medicine. The intent is to establish this center of excellence in Ethiopia where, after gaining acceptance by the African Union, neighboring countries can send their military medical personnel for tactical combat casualty care (TCCC) and other combat medical training. If COL Mouri and I can get this established, I would like to use this as a model for other centers of excellence throughout the continent.

We have other smaller projects as well. We're looking into collaborative efforts with South Africa; Algeria might be interested in certain clinical training; we will be active in Democratic Republic of the Congo in the near future, and we maintain a presence in Burkina Faso and Mali. Acknowledging that I have not been as involved with the civil affairs side of the house as I should be, I have actively been looking for a way to bridge this gap. Ideally, I would like to bring a nurse practitioner on-board in this role.

Currently, I'm challenged with the modest operational slate mentioned above given my personnel limitations. The SOCAFRICA Surgeon section is a two-man shop: me and MAJ Mike Nack, my ESO/med planner/Deputy. We are expecting incoming personnel over the next two months, including an 18D, Independent Duty Medical Technician (IDMT), and a USAF med planner. Come the new fiscal year, we should also have a Navy medical logistics NCO, at which time we will be a fully manned section. As needs arise, we'll use the Joint Manning Document and Joint Table of Mobilization and Distribution to find additional bodies.

The upcoming challenges are many: we continue to work manning issues; we provide medical planning support as needed, in compliance with the AFRICA Command Surgeon; we are trying to establish a travel medicine clinic which can better support our HQs personnel clinical requirement; we are preparing to assume control of the Joint Special Operations Task Force-Trans Sahara (JSOTF-TS) medical mission; and we continue to develop our other medical initiatives. The next several years should be very interesting, if nothing else.

As final note, I would like to thank LTC Rowe and his staff for all their assistance on the JSOTF-TS transfer - my deepest gratitude. Best of luck to Rusty on his new endeavor.

Rusty Rowe, MD
LTC, USA
SOCEUR Surgeon

As I complete my second year as the Special Operations Command Europe Surgeon, I must regretfully say goodbye to the excellent team that has propelled medical planning and operations into the mainstream of TSOC business. While COL Pete Benson and Maj Dan Donahue opened the doors of the medical section in SOCEUR, Lt Col Rich Smith, CPT Trish Bedestani, SFC Russ Brion, and Mr Kevin Fish have proved to be an unmatchable medical planning team for the command. They have planned the successful medical support and integration for the Jackal Stone exercises, Flintlock exercise, Austere Challenge 09, and Cold Response series; while simultaneously expertly responding to the real world challenges of an ever changing and developing landscape in Eastern Europe and the Balkans. Their support has streamlined the continued presence of Special Forces Soldiers in Afghanistan under the NATO umbrella executing missions in support of International Security Assistance Force in Afghanistan (ISAF).

The SOCEUR Surgeon section continues to look into the future to provide COMSOCEUR with critical tools needed to accomplish the mission of providing a rapidly deployable force throughout the continent for contingency operations. Through expert planning and partnership between SOCEUR, AFSOC, 3rd Air Force, and USAFE, the first permanently assigned Special Operations Surgical Team and Critical Care Team will join the 352 SOG and SOCEUR. Additionally, the team is pushing USSOCOM's Wounded Warrior Rehabilitation Program with a potential partnership with the University of Pittsburgh Sport Medicine Research Department, led by Dr Scott Lephart. The opportunity to create a uniquely joint facility focused on SEALs and SF Soldiers training and rehabilitating together exists in SOCEUR, where the effort is focused on "scientific investigation for application."

Thanks to the SOCAFRICA medical team for partnering with the SOCEUR medical team to smoothly transition the medical missions on the African continent over to LTC Rick Ong and his team. You have it!

Finally, thanks to my fellow servicemembers at USSOCOM, USASOC, AFSOC, WARCOM, and even the AMEDD for supporting the initiatives, requirements, and opportunities to support our Special Operations Forces in the EUCOM AOR. COL Farr, thanks for your continued guidance and support throughout the last two years. I will officially turn my position over to Lt Col Mark Ervin, the current AFSOC SGO this May. The future is unlimited.

TSOC SURGEON

SOCPAC

Frank J. Newton, MD
COL, USA
Command Surgeon

There has been much discussion about forward surgical care in support of SOF. In a previous column, Fall 08, I wrote about the continuous presence of this capability in the southern Philippines. Since the spring of 2006, these teams have been persistently engaged in civil-military operations there. Initially, a well-trained Air Force Special Operations Surgical Team (SOST) and 3-man Special Operations Critical Care Evacuation Team (SOCCET) were deployed. Due to the limited number of SOSTs in the inventory, manning of this requirement transitioned to the Pacific Air Force one year ago. The 5-man Mobile Field Surgical Teams and 2-man Critical Care Evacuation teams have continued to provide quiet professionals to stand in the breach created by global terrorists and regional insurgents in the Sulu Archipelago. These professionals have done an outstanding job of supporting the Joint Special Operations Task Force (JSOTF) - Philippines Commander's mission, which includes "advising and assisting our partners in the Armed Forces of the Philippines (AFP) … and to help the AFP become an increasingly professional and capable security force." Having been a witness to the work done in this Joint Operations Area for the past four years, first as Group Surgeon with the First Special Forces Group (Airborne), and presently as Command Surgeon, Special Operations Command Pacific (SOCPAC), I have seen the value of advanced tactical combat care in counterinsurgency (COIN) operations.

The center of gravity for the COIN effort is the people who live where extremist elements live. Securing the support of the people and winning their hearts and minds requires persistent engagement. "By, with, and through" the AFP, interagency partners, and civilians, these strong relationships are effectively shifting the people's loyalty from violent extremist organizations to that of the legitimate government of the Philippines. Using the indirect approach, our Forward Surgical Teams and Critical Care Evacuation Teams have been very effective at building the capacity of our partners in this region. They have done this through subject matter expert exchange (SMEE), medical seminars, and a ubiquitous presence working side-by-side with their AFP partners in the trauma bay and operating rooms.

One recent example of this collaboration and interoperability follows. Two AFP Marines were ambushed; one had lower extremity wounds from a machete, but was hemodynamically stable. The other was shot at close range with a high velocity weapon. His blood pressure was 50 palpable. A tourniquet had been applied to his right thigh and he was hastily brought to the AFP trauma center. Within minutes, the AFP surgical team was augmented by a USAF general surgeon, an emergency medicine physician, and an orthopedic physician assistant. The patient was stabilized with 20 units of fresh whole blood. His femoral artery, which had been transected by the ballistic injury, was repaired with a polyethylene graft prostheses. Remarkably, he was MEDEVAC'd to the AFP Medical Center in Manila with a warm extremity and a palpable pedal pulse. The fact that he survived his wounds is remarkable. Many Marines, Soldiers, and civilians lives have been saved, and a great deal of good will has been created. In everything that is done, the goal is always to put the spotlight on the host nation's efforts. De Opresso Liber

Members of the USAF Critical Care Evacuation Team (CCET) and counterparts from the AFP preparing a Filipino marine for medevac upon a USAF PC-12.

Members of USAF Mobile Field Surgical Team (MFST) working by, through, and with their Armed Forces of the Philippines surgical counterparts at the AFP Trauma Center on Jolo, Southern Philippines

Special Forces Surgeon

USASFC

Peter J. Benson, MD
COL, USA
Command Surgeon

The future will undoubtedly bring new challenges as a new national strategy develops. The employment of Special Forces in relation to conventional force operations and structure is bound to change. This will present new challenges in the provision of health service support (HSS) in far-forward and austere areas, especially if conventional HSS supporting structure is down-sized or eliminated in the area of operations. Providers at all levels must pay particular attention to HSS requirements in planning and clearly articulate them to operations staffs and commanders.

Training and readiness for each Battalion and Group will continue to gain increasing visibility as part of updated readiness reporting. The periodic health assessment, pre- and post-deployment health assessments, immunization, and dental readiness are non-negotiable programs that must be completed. The USASOC Commanding General has mandated 100% completion on all health assessments. Only dedicated provider-driven, command-supported effort will meet completion requirements. The appropriate providers at each level must engage in and monitor these programs and meet the standard – at Detachment, Battalion and Group levels.

I would like to commend all the Special Forces Regiment's providers for their dedication and effort to provide the very best medical support to their units. The number of exercises, pre-deployment training events, and the persistent engagement in Operation Enduring Freedom and Iraqi Freedom have put an immense stress on all the Special Operations Combat Medics, Special Forces Medical Sergeants, physician assistants, and surgeons in the Regiment. Yet, through the continuous cycle of preparation, deployment, and refit, the commitment and hard work by all providers has been exceptional. The ability of our providers to continually support the Regiment's on-going commitments in far-flung global engagement with a minimum of external support is one of our greatest assets. I challenge each provider to maintain their dedication and to maintain their skills; continue to learn and to remain one step ahead of the threat.

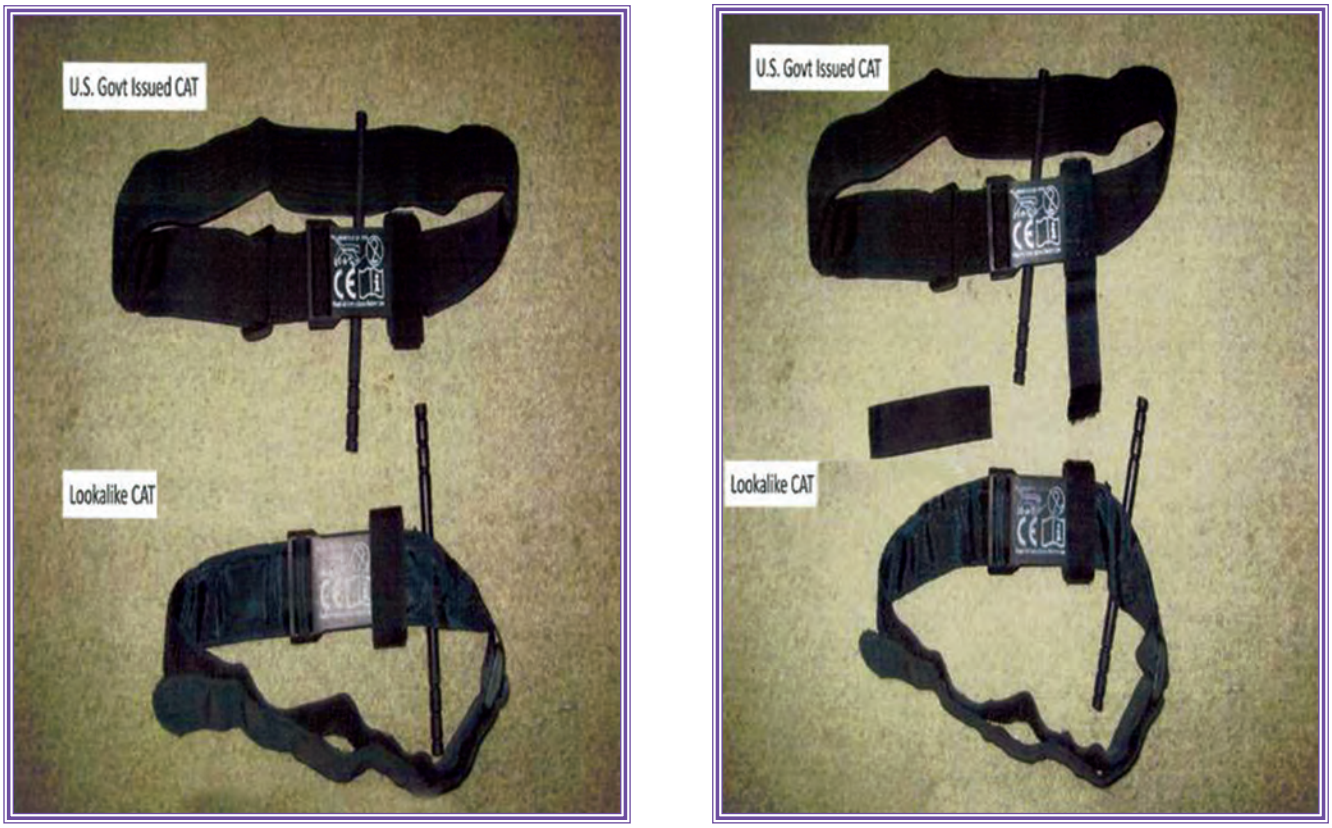
Lastly, the articles in each JSOM issue showcase the great work, experience, and innovation of our providers, in training and in combat. I urge all the Regiment's medics and professional medical, veterinary and dental providers to contribute an article, case presentation, or book review. There is a wealth of experiences and knowledge in the United States' best medics – let's get them in the Journal.

MEDICAL LOGISTICS HOT!

MAJ Pete Franco
USSOCOM, Office of the Command Surgeon
Medical Logistics Plans and Operations

ALERT – WATCH FOR "LOOK ALIKE" COMBAT APPLICATION TOURNIQUET (C.A.T.)

Be advised that "lookalike" Combat Application Tourniquets (C.A.T.s) have been spotted in Afghanistan. Below are photos taken of the actual U.S. government issued C.A.T. with examples of lookalike tourniquets below it. Note that the appearance of the lookalike is similar; however, instead of a solid thick band of material around the entire circumference like on the U.S. government issued C.A.T., the lookalike tourniquet has a much thinner strap on half of the circumference band. Additionally, the lookalike does not contain the Velcro® locking strip.



CAT tourniquets compared

Note that when applied, (see arrows) the lookalike tourniquet (below left) twists and creates less of a wide, even band of compression then found in the actual C.A.T. (below right). Additionally, the fastening of the stick is different and less secure given that the securing Velcro® strip for the stick is missing.

Lookalike tourniquet applied — see arrow

Actual U.S. government issued C.A.T. applied — see arrow

Please note that no negative implications or inferences are directed toward any manufacturer or organization. This alert is simply meant as a precaution to keep an eye out for the lookalike C.A.T.s. as the actual U.S. government issued C.A.T. is much more effective at stopping bleeding.

Skill Identifier for Army Medical Department Officers in Special Operations

MAJ Tony King,
Former Joint Staff and Combatant Command Intern at USSOCOM

As a capstone requirement for completion of his internship last year at United States Special Operations Command (USSOCOM), the author submitted a proposal to the U.S. Army Personnel Proponent Directorate (APPD) to help ascertain U.S. Army Medical Department (AMEDD) officers for Special Operations Forces (SOF) assignments. Approval of this skill identifier (SI) would provide Department of the Army (DA), United States Army Human Resources Command (HRC), United States Joint Forces Command (USJFCOM), USSOCOM, AMEDD, and other U.S. Army elements in combatant commands, a mechanism to identify officers to fill Special Operations' time-sensitive requisitions and/or routine duty positions in a more efficient and effective manner.

1. DISCUSSION

No mechanism in the AMEDD Health Services Division currently exists that can rapidly identify AMEDD officers with SOF experience for time sensitive planning (TSP) or for routine assignments. The current process for selecting officers is by "word of mouth" or requires a manpower intensive screening of an enormous number of individual officer records.

2. BACKGROUND

SOF are trained, organized, and equipped to conduct missions conventional forces are not designed to accomplish. SOF routinely operates in austere and indigenous conditions. SOF success is credited to maturity, cultural attunement, adaptability, and responsiveness. There are four enduring truths about SOF: (1) Humans are more important than hardware; (2) Quality is better than quantity; (3) SOF cannot be mass produced; and (4) Competent SOF cannot be created after emergencies occur. Despite what was previously mentioned, and the SOF truths, the Army's ability to identify capable AMEDD officers for SOF assignments has been disordered.

Due to operational requirements, SOF has transformed significantly over the last six years. This transformation encompasses all facets of Special Operations – personnel, force structure growth, budget, training, equipment, and acquisitions, operations, and education.

3. FACTS BEARING ON THE PROBLEM

a. The Quadrennial Defense Review (QDR) directed growth in both size and capabilities of SOF to accomplish increased missions and responsibilities of synchronizing the Global War on Terror (GWOT). The QDR directed growth will occur over a span of five years and will result in a net gain of over 4,000 billets to USSOCOM's force structure end-strength.

b. Army Special Operations Forces (ARSOF) account for approximately 70% of USSOCOM's strength and capability.

c. The over 150 AMEDD in SOF exceed the minimum requirement of 20 billets to request a new SI as described in AR 611-1, Military Occupational Classification Structure Development and Implementation, Chapter 4, Section I, Para 4-4g(2).

d. The following U.S. Army SI/SQIs have been approved for AMEDD personnel (non-18 series): Special Operations Support Personnel (S), approved since MAR 1999 for Enlisted only; Special Operations Combat Medic (W1); Civil Affairs Medical Sergeant (W2); Civil Affairs Trauma Medical Sergeant (W4); SERE Psychologist (M6); and Diving Medical Officer (M7).

e. The U.S. Navy has additional qualification designators (AQD) of QK1, QK2, and QK3 which identify all non-Sea, Air, Land (SEAL) and non-Special Warfare Combatant-Craft Crewmen (SWCC) officers who have Naval Special Warfare Experience.

f. The U.S. Air Force released a special experience identifier (SEI) of Special Operations Command Medical Officer (MC) on 31 JAN 2008.

4. CONCERNS FROM THE FIELD

a. This SI will affect assignment opportunities. Per AR 611-1, Military Occupational Classification Structure Development and Implementation, Chapter 4, Section I, Para 4-2b(4), SIs do not require repetitive tours and do not provide progressive career developmental assignments. This means that a traditional AMEDD officer who is assigned to a SOF designated unit and awarded the SI **IS NOT** required to remain in the "SOF community" for the remainder of his or her career.

b. This SI will "tag" or "pigeon-hole" AMEDD officers once approved. An argument of this concern would be the management and current use of AMEDD officers with logistics (FA 90) designation. A fair amount of AMEDD officers have the FA 90 designation in their records but have never been assigned in a FA 90 billet or have not continued to meet the progression required of this designation. Furthermore, their records reflect multiple and consecutive assignments in medical functional area billets.

c. Funding. No funding is required; experience/training is gained through OJT/OJE. (DA PAM 611-21, Military Occupational Classification And Structure, Chapter 4, Para 4-1b(3).)

5. ADVANTAGES

a. This SI will allow timely identification of SOF experienced AMEDD officers for the force provider planners to meet TSP and contingency requirements. This SI would identify officers who are: knowledgeable in SOF missions, activities, and organization; culturally attuned; familiarized with SOF-peculiar equipment; and most importantly – competent to support today's SOF Warrior.

b. This SI would provide management data, predictability, and production of qualified AMEDD officers to the customer before, during, and after emergencies occur.

c. Those obtaining this SI, as proposed, will demonstrate increased technical knowledge and skill set.

6. PROPOSED SKILL IDENTIFIER

If approved, the SI could read as follows in DA PAM 611-21:

a. Proposed Title: Special Operations AMEDD Officer (Code TBD).

b. Proposed Description: Identifies AMEDD commissioned and warrant officers with previous training, assignment, or deployment experience in Special Operations Forces (SOF) designated units, Civil Affairs, and Psychological Operations.

c. Proposed Qualifications: Complete 12 months in an active duty capacity in any AMEDD area of concentration (AOC) with a SOF designated unit, participate in a SOF designated unit deployment/mission for four consecutive months, or be Special Forces, Civil Affairs, or Psychological Operations qualified. United States Army Reserve and National Guard AMEDD officers require the same qualifications, but have to complete a cumulative 24 months of assignment in a SOF designated unit.

d. Proposed Restrictions: For use with any AMEDD AOC. This SI can be retroactively awarded to personnel currently serving who have successfully served in accordance with above qualifications. Withdrawal of the SI may occur when the local SOF commander determines the individual to be unqualified or at the request of the individual officer.

7. CURRENT STATUS

Recently, the submitted proposal was deliberated again at APPD by the current staff in USSOCOM Surgeon's Section. Expect the proposal to be approved and released for use in the upcoming months.

USSOCOM Psychology

LTC Craig A. Myatt, Ph.D., HQ USSOCOM Psychologist

Over the past quarter, the Command Surgeon's Office at the United States Special Operations Command (USSOCOM) initiated the formulation of a Resilience Enterprise Working Group (REWG). Officially chartered by the USSOCOM Chief of Staff and chaired by the Command Surgeon, the REWG includes members from the J-staff personnel in selected USSOCOM centers and mental health personnel from the headquarters and each component. When the REWG conducted its first official meeting, the members reviewed component best business practices and began the process of identifying component capabilities and potential capability gaps that can be bridged through a formal Command-sponsored program. The process required for the development of a program intended to sustain resilience in Special Operations Forces (SOF) and SOF families is outlined by Joint Capabilities Integration and Development System (JCIDS) and Special Operations Forces Capabilities Integration and Development System (SOFCIDS).

Prior to the first REWG meeting, the USSOCOM Commander provided direct guidance on how he expects the developing program to offer centralized oversight with decentralized execution. In short, the USSOCOM Command Surgeon's Office is directed to support the components as each component command develops a program, or strengthens a pre-existing program, that sustains resilience in SOF personnel and family members. The role of the Command Surgeon's Office in providing direct support to the component command psychologists and psychiatrists in each component command surgeon's office grew tremendously over the past quarter. That role will continue to grow as we target and move toward a desired end state.

What is the end state? The end state of the developing program is to sustain enduring operational readiness in SOF and SOF families. The methods employed to achieve that end state will include the use of metrics intended to offer commanders, first-line supervisors, other SOF personnel, and SOF families a "resilience profile" for monitoring Operations Tempo Behavioral Effects (OTBE). The application of a "resilience profile" is currently being developed by Naval Special Warfare Command, Group One. The use of a "resilience profile" and other applications in resilience currently underway at USASOC, AFSOC, and MARSOC are all intended to promote hardiness and strengthen operational readiness in SOF personnel and their families as a means of minimizing disruptions in mission-focused operations and family life despite an increasing operations tempo (OPTEMPO). Resilience is a biobehavioral factor that can be assessed for continuous feedback through command channels.

Mental health readiness in theater and the continental United States (CONUS) is an operational force health protection issue. As we build stronger mental healthcare readiness and resilience in SOF personnel and family members, we can improve overall operational readiness and performance within units. Systems improvements throughout SOF that support our building resilience in SOF personnel and families will require doctrinal review and change. Resilience is a broad enough biobehavioral term that it can be defined doctrinally in combat operational terms relevant to commanders and first-line supervisors. It can also be defined in SOF peculiar cultural terms relevant to family members. Resilience for SOF personnel and families is a force multiplier tactically, operationally, and strategically with inherent social and economic implications.

USSOCOM VETERINARIAN

LTC Bill Bosworth, DVM, USSOCOM Veterinarian

Greetings from the Florida Gulf Coast! I'd like to welcome two new component veterinarians to the SOCOM community. The first is LTC Anthony Bostick who is heading to Fort Bragg to become the new USASOC veterinarian. He has just finished up commanding the 43rd Medical Detachment (Veterinary Services) in Iraq, where he was responsible for overseeing the care of all the military working dogs in theater, as well as the food safety and food defense missions. He also has a background in laboratory animal medicine, which will serve him well overseeing the schoolhouse. MARSOC is getting their first veterinarian, CPT Darrin Harrison, this summer as well. CPT Harrison comes to us from Fort Stewart, Georgia, where he was the OIC of the post veterinary treatment facility. He did a great job supporting the 1st Ranger Battalion while he was out there, and MARSOC is looking forward to putting him to work on their dog program.

I'd also like to offer my congratulations on a job well done to MAJ Steve Baty, the outgoing USASOC veterinarian. He has worked with both the USASOC and MARSOC Multi-Purpose Canine (MPC) programs to procure healthy dogs and to train the medics and handlers as canine combat lifesavers. He has overseen a large increase in the numbers of MPCs in the force. MAJ Baty will be heading to the Centers for Disease Control and Prevention (CDC) to attend the two-year Epidemic Intelligence Service post-graduate program where he'll be training to use his epidemiological skills in different field assignments throughout the country. Good luck on your new endeavors!

The new buzzword in the Army is PDTT, or predeployment trauma training. Recently, the Army Surgeon General released new guidance for Army units (all components) that want to conduct PDTT for their 68W combat medics and medical providers, to include physicians, PAs, oral surgeons, nurse anesthetists, RNs, and nurse practitioners. This guidance specifically exempts USASOC units and personnel and applies only to the Big Army. The AMEDD Center and School (AMEDDC&S) will be responsible for providing all PDTT as of 1 October 2009. Until that time, AMEDDC&S will certify contract vendors to provide PDTT in the interim when the school cannot support the units. The DOD Veterinary Services Activity will be responsible for evaluating the vendors and maintaining a DOD-level approved vendor list. The AMEDDC&S evaluation process is very similar to the process that our Surgeon's Office implemented in 2006. The vendors will be limited to training personnel on AMEDDC&S approved procedures for any of the PDTT courses that a unit requires. The contract vendors can also be used after 1 October 2009 if AMEDDC&S cannot support PDTT requirements.

We are also awaiting the arrival of the joint analysis team report that I wrote about in the last issue. Once the report is released, we will work on new policy guidance from our office to comply with the new DOD rules and regulations and get that out to the components. Expect to see that we will continue to maintain the highest standards for training our medics and providers.

That's all for now from sunny Florida. Once again, let's wish MAJ Baty a job well done and welcome our two new component veterinarians.

Need to Know

USACHPPM
Readiness thru Health

36-019-0209

Just the Facts...

Charmak Disease In Afghanistan

What is charmak disease?
Charmak disease, sometimes called Gulran disease or camel belly, is an unusual and potentially fatal liver disease. It is caused by eating wheat flour contaminated with seeds of charmak weeds (*Heliotropium* plants), which contain pyrrolizidine alkaloids. Charmak weeds grow in wheat and other grain fields following abnormally dry weather. While not exclusive to Afghanistan, recent outbreaks of charmak disease have been reported in the Gulran district of Herat Province.

How common is charmak disease?
Charmak disease is fairly uncommon. Intermittent outbreaks have been reported in the Gulran district of Afghanistan dating back to the mid-1970s.

How do you get charmak disease?
Soldiers can get charmak disease by eating flour-based foods, such as bread, that have been derived from wheat grain harvested from fields with a high concentration of charmak weed. It is believed that it is also possible to get the disease by drinking milk from goats that graze on charmak weeds.

What are the symptoms of charmak disease?
Early symptoms of charmak disease include anorexia, loss of weight, fatigue, severe abdominal pain, and vomiting. Liver damage, jaundice, and a hugely extended stomach often appear several weeks after symptoms begin. The liver damage is caused by the obstruction of major veins in the liver associated with consumption of pyrrolizidine alkaloids. Left untreated, charmak disease can be fatal within 3 to 9 months following the appearance of an extended stomach.

How is charmak disease diagnosed?
The most conclusive way to diagnose charmak disease is through biopsy of the liver.

How is charmak disease treated?
Treatment of charmak disease involves eliminating contaminated food from the diet, improving nutrition, using vitamin and mineral supplements and providing good hospital care. Extracting unnecessary liquids from a patient's swollen stomach may also be helpful in serious cases. Action should be taken quickly once the toxicity becomes evident and should be overseen by a medical provider at all times.

How can you prevent charmak disease?
Soldiers can prevent charmak disease by not eating or drinking any locally grown or produced foods or beverages while deployed in Afghanistan.

**The majority of this content was gathered from newspaper articles, and as a result, the accuracy of the information provided above could not be fully verified.

Sources:
World Health Organization, September 2001./IRIN, 15 May 2008, 16 December 2008, 18 December 2008./The Lancet, August 1976, volume 2, issue 7980, pp 269-271.

Content reviewed by the National Center for Medical Intelligence

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HEALTH AFFAIRS

MAR 1 2 2009

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (M&RA)
ASSISTANT SECRETARY OF THE NAVY (M&RA)
ASSISTANT SECRETARY OF THE AIR FORCE (M&RA)
DIRECTOR, JOINT STAFF

SUBJECT: Policy for Decreasing Use of Aspirin (Acetylsalicylic Acid) in Combat Zones

Aspirin is a common and inexpensive over-the-counter medication that inhibits platelet aggregation, an essential step in the blood clotting process. The use of aspirin may increase blood loss immediately after injury, and has been documented to increase blood loss during surgical operation. Practices in stopping aspirin prior to surgery have changed in some instances because of other relative risks, but the most common cause of preventable death associated with combat injuries is blood loss. The intent of this policy, as with other changes in combat casualty care, is to reduce blood loss at the point of injury, and provide the widest margin of safety for evacuation of casualties to forward resuscitative or theater hospital level care.

Therefore, the Services will create and implement programs to ensure that all individuals, military and civilian, deploying to a combat zone, are advised during the pre-deployment process to stop taking aspirin, either alone or in combination remedies, at least 10 days before departure, unless advised by their health care provider to continue use. Your program should explain the dangers of the unnecessary use of aspirin to your health. If aspirin use is necessary for medical reasons, then such need should be documented in the medical record.

Access to aspirin in the combat zone should be controlled. There should be no over-the-counter access through Army and Air Force Exchange Service outlets or other Morale Welfare and Recreation activities. These activities are encouraged to stock over-the-counter alternatives (e.g. Acetaminophen (Tylenol®, Datril®), Ibuprofen (Motrin®, Advil®), and Naproxen (Aleve®)) for self-treatment of aches and pains that do not have significant effects on the blood clotting system. Medical units and each individual in the combat zone may carry stocks of aspirin for specific medical indications.

My point of contact for this matter is Colonel Tony Carter, who can be reached at (703) 578-2674 or tony.carter@ha.osd.mil.

S. Ward Casscells, MD

cc:
DUSD (MC&FP)
Service Surgeons General

Picture This...

Kent Handfield, MD; Wiley Smith, MD

Figure 1

Figure 2

You are deployed with your unit to Central America, in an area where malaria is endemic. One of your men complains of non-tender, non-pruritic swelling, and purple/red discoloration of the skin in and around a recently acquired tattoo on his chest (Figure 1). Using the primary lesion definitions outlined in your SOF medical handbook, how would you describe the morphology of this lesion? What are your concerns?

He also complained of an area on his right anterior shin (Figure 2). Using the primary lesion definitions, how would you describe the skin lesion on his leg? Could the swelling around the tattoo be related to the lesion on his shin?

The patient stated that neither areas of concern prevented him from carrying out the mission but he wanted to make sure it wasn't "anything serious". A review of systems showed that he was not taking any med-

ication at the time, which included the required malaria prophylaxis. Could missing his malaria prophylaxis have anything to do with his chest and leg?

His past medical history is significant for a shrapnel injury sustained to his right shoulder that required surgical debridement two years prior. After surgery, he was treated with steroid injections for keloids that formed around the wound. With his history of keloids, you decide that the inflammation around his tattoo is probably secondary scar changes consistent with keloids. You give him some topical steroids and defer definitive treatment for when you return to the U.S. Although you're not exactly sure what the leg lesion is, you decide to treat it as cellulitis by giving him dicloxicillin to prevent further complication. You also tell him to start taking his chloroquine to prevent malaria. After several weeks in the field, the lesions in and around the serviceman's tattoo and on his right leg showed some evidence of regression.

Answers

1. You should be concerned that in a recently acquired tattoo he could be having an allergic reaction to the ink, an infection secondary to unclean tattooing techniques, or possibly hypertrophic scar formations, also known as keloids.

2. The lesion in the picture is described as a large, well-demarcated red/brown atrophic plaque with overlying white scale at the borders. This is a non-specific finding and could indicate any number of skin diseases. Given your forward deployed status you must be concerned about potential "show stoppers" like infection. You treated the patient for a presumed cellulitis; however, upon closer inspection you can see in Figure 1 that the usual angry redness is absent. Also cellulitis usually has an indistinct border. Here in this lesion, it is easy to see where normal skin ends and the lesion begins.

3. Malaria is typified by fevers, malaise, musculoskeletal pain, (none of which is seen in this patient) and not by skin findings. Although it is important for the patient to take malaria prophylaxis in this endemic region, based on the facts presented it is unlikely that missing his prophylaxis medication has caused him to develop malaria.

Approximately one month after completion of his mission and return to the U.S., the same serviceman begins to complain of a few small bumps on his neck and face. These papules are red to brown in color with irregular shapes, but well demarcated borders. In conjunction with these lesions, he begins to experience mild dyspnea with exertion during physical training sessions. You order a chest X-ray, which reveals bilateral hilar adenopathy. Concerned for possible tuberculosis, you also order a PPD and a chest CT. The PPD is negative, but the CT confirms the presence of bilateral lung nodules, suspicious for a granulomatous disease. You think maybe the lung findings are related to the skin lesions so you refer the patient to the base dermatologist who performs a biopsy of a representative papule on the neck. The pathology shows multiple non-caseating granulomas in the dermis. Special stains for acid fast bacilli and fungal infection are negative. The clinical and histological findings are consistent with a diagnosis of sarcoidosis.

Discussion

Sarcoidosis is a systemic disease that affects approximately 0.1 to 0.64% of the U.S. population, most commonly in the age range of 20 to 40 years old.[1] It presents in the lungs in 95% of cases. Cutaneous manifestations are, however, the second most common presentation, occurring approximately 15% of the time.[2] In some instances, cutaneous involvement is the only manifestation of the disease. Skin lesions are seen more often among African Americans, occurring roughly 50% more frequently than in Caucasians.[2] There are several forms of cutaneous sarcoidosis that may be confused with other dermatological disorders in the absence of a biopsy.[3] The clinical presentation seen most often is papules on the neck and face with a predilection for the periorbital region. Papules may coalesce into plaques. Miliary sarcoid is the term used to describe numerous smaller, non-coalescent papules that are generalized throughout the skin.[1] Scar sarcoidosis is another common manifestation of cutaneous sarcoid, causing once flat scars to become raised and at times painful. This presentation looks similar to, and may be mistaken for, keloids or hypertrophic scars. The typical appearance is a purple-red or erythematous discoloration. Tattoos or other skin that is embedded with foreign substances is especially prone towards involvement, and on occasion may be the initial presentation of systemic sarcoid.[1] Lupus pernio is a form of cutaneous sarcoidosis that is similar to cutaneous tuberculosis. It is most commonly seen as symmetrically distributed violaceous plaques and nodules on the nose, ears, cheeks, and fingers. Lupus pernio lesions can extend into the bone, especially the nasal bridge, and is often associated with upper respiratory tract involvement, pulmonary fibrosis, and granulomas in the bones.[1] Patients with sarcoidosis may develop a common, non-specific skin finding called erythema nodosum (EN). EN are tender subcutaneous nodules with overlying erythema that can occur most often on the anterior shins, but can be seen on the upper legs, extensor arms, neck, and rarely the face. The presence of EN in a patient with sarcoidosis portends a good prognosis, with

a resolution rate of 80% within the first two years. When erythema nodosum is present with hilar adenopathy and periarticular ankle swelling, it is referred to as Löfgren syndrome.[4] Various other forms such as ichthyosiform, alopecia, psoriaform, macular, nodular, erythrodermic, and ulcerative cutaneous sarcoidosis also exist.[1,5] Skin biopsy is the gold standard for diagnosing cutaneous sarcoidosis, revealing the presence of non-caseating granulomas. Granulomas can be seen in a variety of other disorders, including tuberculosis. Therefore, biopsy findings consistent with a granulomatous process should prompt the healthcare provider to order a PPD if clinically warranted. A diagnosis of cutaneous sarcoidosis should prompt an investigation for systemic disease. Besides the lung, other organs can be involved in this disease including heart, brain, spleen, eyes, and the lymphatic system.[6]

Randomized controlled trials for the treatment of cutaneous sarcoidosis are lacking. However, anecdotal evidence has been used to treat cutaneous sarcoidosis with good success. High potency topical steroids[7] or intralesional steroid injections[8] are often effective treatment for lesions affecting relatively small surface areas. Larger skin lesions and systemic disease require the use of oral medications. Some evidence supports the use of antimalarials such as chloroquine[9] or hydroxycholorquine[10] as first line therapy for extensive skin and systemic disease. Unfortunately, antimalarials are not curative but rather suppressive, resulting in relapse of the disease after discontinuation of the antimalarial agent. More potent oral therapy, such as high dose corticosteroids or methotrexate,[11] should be used after failure of topical treatment and antimalarials, keeping in mind that their potential for serious side-effects is substantially greater.[12] Alternatively, tetracycline antibiotics have also shown promise.[13] The biologic agent infliximab, a monoclonal antibody that down-regulates the immune system's inflammatory response, has shown exceptional efficacy.[14] Finally, laser surgery can be an effective treatment for difficult to treat cutaneous sarcoidosis.[15,16]

If you are DEPLOYED and have a concern about a puzzling skin lesion you can contact me directly at Daniel.schissel@us.army.mil with a good description of the primary lesion and a digital photo or contact our Operational Teledermatology site derm.consult@us.army.mil. The lesion you describe just may makes its way to **Picture This… Thanks for all you do.**

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LCDR Kent Handfield was commissioned as a line officer after graduating from the University of Virginia in 1995. He completed nuclear and submarine training and served as a submarine officer on the USS COLUMBIA before reporting for shore duty at COMSUBPAC in Pearl Harbor, Hawaii. Kent transferred to the medical corps in 2001 and attended Vanderbilt University School of Medicine in Nashville, Tennessee. He completed a surgical internship at the Naval Medical Center San Diego in 2006 followed by training and certification as an Undersea and Diving Medical Officer. Currently, he serves as the Medical Department Head at the Naval Submarine Support Center in Groton, Connecticut.

LCDR Wiley Smith is a 2002 graduate of the Uniformed Services University School of Health Sciences. He completed his transitional internship at Naval Medical Center Portsmouth in 2003. In 2004 he completed his training and certification as an Undersea and Diving Medical Officer. He then served three years as the Senior Medical Officer for the Naval Submarine Support Command, Pearl Harbor. Currently he is in dermatology residency at Naval Medical Center San Diego.

COL Daniel Schissel originated "Picture This" for the Med Quiz. He is a 1993 graduate of the Uniformed Service University of the Health Sciences and completed his internship with the family practice department at Fort Bragg in 1994. He then served as the 2/10th Special Forces Group (Airborne) Surgeon and followed on as the 10th SFG(A) Group Surgeon. He completed his residency training in dermatology at the Brooke Army Medical Center in 1999. COL Schissel is presently stationed in Heidelberg, Germany as a staff physician and the European Regional Medical Command Dermatology Consultant. He has been selected as the U.S. Army OTSG Dermatology Consultant. COL Schissel has authored the dermatology section of the new SOF manual, serves on the USSOCOM Medical Curriculum and Examinations Board, and is the U.S. Army Aviation Dermatology Consultant.

Meet Your JSOM Staff

EXECUTIVE EDITOR

Warner Dahlgren Farr, MD
warner.farr@socom.mil

COL "Rocky" Farr was the distinguished honor graduate of his Special Forces 18D class in 1968 and complets 42 years of active service in April. He served as a recon team member with the 5th SFG(A) in SOG-Studies and Observations Group. He attended the DLI (German) and joined Detachment A, Berlin Brigade, an early special mission unit. He became the SF instructor at the ROTC Detachment, Northeast LA University and completed his BS. As a SFC, he taught in the 18D course and was selected for MSG. COL Farr was accepted to the Uniformed Services University of the Health Sciences and while a medical student, he was the medical platoon leader for the 11th SFG(A). He received his MD in l983 and has completed residencies in aerospace medicine, and anatomic and clinical pathology. He commanded Company F (ABN), 3rd BN, Academy BDE, Academy of Health Sciences as Course Director of the Special Operations Medical Sergeant's Course; and advisor to the 12th SFG(A). He was Chief, Department of Pathology, Blanchfield Army Community Hospital, and Flight Surgeon, 50th Medical Company (Air Ambulance), 101st ABN Division (Air Assault). COL Farr was the Division Surgeon of the 10th Mountain Division (Light Infantry) until becoming Deputy Commander of the U.S. Army Aeromedical Center. He attended the Air War College before becoming the Deputy Chief of Staff, Surgeon, U.S. Army Special Operations Command; Command Surgeon, U.S. Army Special Forces Command; and Command Surgeon, U.S. Army Civil Affairs and Psychological Operations Command. He became the Command Surgeon of the U.S. Special Operations Command in Tampa, FL in July 2006. He has numerous operational tours to include Bosnia, Kosovo, Kuwait, Vietnam, Cambodia, and Afghanistan.

MANAGING EDITOR

Michelle DuGuay Landers, RN
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Lt Col Landers joined the Army Reserve in 1987 and served as a nurse in a Combat Support Hospital unit for three years before switching services in 1990 to become an Air Force C-130 Flight Nurse. She is currently an IMA reservist attached to the SOCOM/SG office where she has been in charge of management, production, publication, and distribution of the JSOM since its inception in Dec 2000. Lt Col Landers has a Bachelors in Nursing and a Masters in Business Administration/Management. Her 23 year nursing career includes being a flight nurse in both the military and private sector, 15 years of clinical experience in emergency and critical care nursing as well as being an EMT and a legal nurse consultant. She also served as the military liaison to her Disaster Medical Assistance Team (DMAT). Prior to the SG office, Lt Col Landers' experience at USSOCOM includes an assignment in the Center for Force Structure, Resources, Requirements, and Strategic Assessments.

Submission Criteria

1. Use the active voice when possible. This is our most common editorial problem and often requires extensive re-writes. Use the sequence "subject - verb - object."
2. Secure permission before including names of personnel mentioned in your piece. Do not violate copyright laws. If the work has been published before, include that information with your submission.
3. Format articles to be single-spaced, eleven point Times Roman font, aligned on the left, and justified on the right. Double space between sentences.
4. **Important:** Include an abstract, biography, and headshot photo of yourself as part of the article. Important: Include an abstract, biography, and headshot photo of yourself as part of the article. Include three learning objectives and ten test questions if article is submitted for continuing education.
5. Use a minimum of acronyms; spell out all acronyms when first used. Remember that your audience is inter-service, civilian, and international.
6. Put the point of the article in the introductory paragraph and restate it in the closing or summary. Subtlety is not usually a virtue in a medical publication.
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8. Cite all references in chronological order. **DO NOT insert footnotes or use roman numerals**. Give the full name of the journal, book, or website cited. Use the following style of citation when referencing a **Journal article** - Vogelsang, R. (2007). Care of the military working dog by medical providers. *Journal of Special Operations Medicine*; 7(2)(Spring):33-47. **Newspaper article -** Di Rado, A. (1995, March 15). Trekking through college: Classes explore modern society using the world of Star Trek. *Los Angeles Times*, p. A3. **Book article or chapter -** Giger, Urs (2000). Blood typing and crossmatching to ensure compatible transfusions. In John Bonagura Ed. Kirk's *Current Veterinary Therapy XIII Small Animal Practice*. Philadelphia, WB Saunders Co. 2000, p. 140-147. **Website -** Miles, D. (2004, Sep. 3), Military working dogs protect Forces, bases during terror war. Armed Forces Press Service. Retrieved July 1, 2008 from Defense Link website. Website: http://www.defenselink.mil/news/newsarticle.aspx ?id=25393. If unsure, please contact us at jsom@socom.mil.
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10. Send submissions by email (preferred method) to JSOM@socom.mil, or you may send articles on diskette, or CD, by mail to: USSOCOM Surgeon's Office ATTN: JSOM Editor, 7701 Tampa Point Blvd. MacDill AFB, FL 33621- 5323. Retain a copy for yourself.
11. We reserve the right to edit all material for content and style. We will not change the author's original point or contention, but may edit clichés, abbreviations, vernacular, etc. Whenever possible, we will give the author a chance to respond to and approve such changes. We may add editorial comments, particularly where controversy exists, or when a statement is contrary to established doctrine. However, the author must assume responsibility for his own statements, whether in accordance with doctrine or not. Both medical practice and the military doctrine are living bodies of knowledge, and JSOM's intent is not to stifle responsible debate.
12. Special Operations require sensitivity to natives of host countries, occupied regions, and so on. We feel that patronizing terms generally are inappropriate for our pages. Realistic language of operators (including some "four-letter" words) may be tolerated in anecdotal and historical articles, especially when used as direct quotes or when such use is traditional among operators. We will delete or change blatantly offensive use.
13. **All articles written by USSOCOM members must be reviewed and pre-approved by your commander, component surgeon, and PAO prior to submission to the JSOM. Authors must adhere to standard OPSEC practices and refrain from mentioning specific units, specific locations, troop strengths, names of actively serving SOCOM personnel, TTPs, vulnerabilities, and any other information that could be of use to an adversary.**
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15. The JSOM is your journal and serves as a unique opportunity for you to pass your legacy to the SOF medical community!

Special Forces Aidman's Pledge

As a Special Forces Aidman of the United States Army, I pledge my honor and my conscience to the service of my country and the art of medicine. I recognize the responsibility which may be placed upon me for the health, and even lives, of others. I confess the limitation of my skill and knowledge in the caring for the sick and injured. I promise to follow the maxim "Primum non- nocere" ("First, thou shalt do no harm"), and to seek the assistance of more competent medical authority whenever it is available. These confidences which come to me in my attendance on the sick, I will treat as secret. I recognize my responsibility to impart to others who seek the service of medicine such knowledge of its art and practice as I possess, and I resolve to continue to improve my capability to this purpose. As an American Soldier, I have determined ultimately to place above all considerations of self the mission of my team and the cause of my nation.

Pararescue Creed

I was that which others did not want to be. I went where others feared to go, and did what others failed to do. I asked nothing from those who gave nothing, And reluctantly accepted the thought of eternal lonliess ... should I fail. I have seen the face of terror; felt the stinging cold of fear, and enjoyed the sweet taste of a moment's love. I have cried, pained and hoped...but most of all, I have lived times others would say best forgotten. Always I will be able to say, that I was proud of what I was: a PJ It is my duty as a Pararescueman to save a life and to aid the injured. I will perform my assigned duties quickly and efficiently, placing these duties before personal desires and comforts.

These things I do,
"That Others May Live."

A Navy Poem

I'm the one called "Doc"... I shall not walk in your footsteps, but I will walk by your side. I shall not walk in your image, I've earned my own title of pride. We've answered the call together, on sea and foreign land. When the cry for help was given, I've been there right at hand. Whether I am on the ocean or in the jungle wearing greens, Giving aid to my fellow man, be it Sailors or Marines. So the next time you see a Corpsman and you think of calling him "squid," think of the job he's doing as those before him did. And if you ever have to go out there and your life is on the block, Look at the one right next to you...

I'm the one called "Doc".

~ Harry D. Penny, Jr. USN

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